LEARNING MADE EASY

6th Edition

Diabetes

for dummies®
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Manage and live well with diabetes

Discover the latest options for monitoring blood sugar

Reduce your risk of diabetes complications

Dr. Simon Poole
Amy Riolo
Bestselling author, chef, Mediterranean Lifestyle Ambassador
Alan L. Rubin, MD

Diabetes

6th Edition

by Dr. Simon Poole
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Published by: **John Wiley & Sons, Inc.,** 111 River Street, Hoboken, NJ 07030-5774, www.wiley.com

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Published simultaneously in Canada

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Library of Congress Control Number: 2023933808

ISBN: 978-1-119-91258-3 (pbk); ISBN 978-1-394-15767-9 (ebk); ISBN 978-1-119-91259-0 (ebk)

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Introduction

Neither one of us began our career knowing that we'd become so involved in supporting people with diabetes. Our shared passion has always been to help people lead their best lives. We both wanted to support people through illness and lead them to better health. As medical and culinary professionals with decades of experience, we soon realized how healthful lifestyle components that could powerfully and positively influence well-being and prevent illness were often missing from people's lives. On a daily basis, we recommend the Mediterranean diet and lifestyle for people in our care and influence to live better and longer. Fortunately, even though we're based in the United States and England, countless principles of this ancient way of living can still be enjoyed today anywhere on the planet.

According to the American Diabetes Association, 1.4 million Americans are diagnosed with diabetes each year. In 2019, 37.3 million Americans, or 11.3 percent of the population, had diabetes. Many nations around the world aren't far behind. There's a need to offer positive, easy-to-implement practices that can prevent people from developing diabetes in the first place, as well as help them reverse, or at a very minimum, live their best life while dealing with it.

You're reading the 6th edition of *Diabetes For Dummies,* and you may be wondering why another edition is necessary. The Centers for Disease Control and Prevention recently suggested that as many as one in three adults in the United States will have diabetes by the year 2050. The International Diabetes Federation reports that 387 million people had diabetes in 2014 and that 552 million will have the disease by 2030 — that's one in every ten people. There has never been a better time to reverse those grim statistics. At the time of writing this book, the amount of free references and information on diabetes, availability of healthful food choices, and information on powerful lifestyle medicine are better than ever. Our intention is to present them in a palatable manner that will enable you or your patients or loved ones to put them to good use.

FROM THE AUTHORS

From Dr. Simon Poole: My journey to combine medical practice with writing and speaking on the subject of diet and lifestyle began several years ago when emerging evidence began to show how powerfully the way we live affects our chances of becoming ill or flourishing in good health. As physicians, we're generally trained

to approach our medical careers with the emphasis on using medicines to reverse established illness. However, I soon realized that the most rewarding approach to medicine was to combine the application of modern medical therapies with a broader paradigm to encourage and inspire people to take control of their health as much as possible through the ways they live their lives.

Many of my patients in Cambridge, England, at first perceived that the journey to an improved lifestyle would be one of pain and misery, but they soon found the opposite to be true. Equipped with a greater understanding of the ways in which exercise and diet (in the form of positive nutrition) can dramatically improve well-being was key to their success. Soon patients who were following a Mediterranean lifestyle were showing powerfully improving results, mirroring as individuals the evidence that was being documented in scientific research. During my career, I've seen rates of obesity, diabetes, and the illnesses associated with these conditions soar. It's become clear that a compelling need exists to look after growing numbers of people with diabetes in our communities with the best possible medical care but also to be empowered to choose the route to optimum health and well-being through wise and enjoyable lifestyle decisions.

Though science and medicine can be complex and sometimes difficult to fully grasp, it's also true that when communicated in a clear and concise way, the stories they tell and the secrets they can reveal may be understood by all. This is the journey on which we have the privilege to be your guides.

FROM THE AUTHORS

From Amy Riolo: My entire career was unintentionally based on diabetes. Had it not been for my mother's diagnosis with type 2 diabetes when I was 15, I'd probably have never thought about it. But I had the responsibility of cooking for my mom and our family, and I chose to use it as an opportunity to help heal her while creating delicious meals that the rest of us would enjoy as well. In those days, my actions were a simple labor of love that I never dreamed would lead to a career. I painfully witnessed my mother and others suffer complications from diabetes that I would love to eradicate forever.

For that reason, I decided to dedicate my life to help others nourish not only their bodies but their minds and spirits as well. I am now a Mediterranean Lifestyle Ambassador because I witnessed my family members living in Calabria, Italy, with relatively few major health complications and enjoying their lives much longer than most people do in the United States. It's not only their diet but also their mentality and lifestyle that makes the difference. Nowadays, each of my cookbooks attempts to capture those often unspoken "secrets" of the Mediterranean diet that make it so successful, while "translating" them in a manner that could be interpreted and followed anywhere.

My greatest goal is to have my readers enjoy as much "sweetness from life" as possible. I believe that time spent with a loved one, a good laugh, holding someone's hand, hugs, watching sunsets, and whatever your daily pleasures happen to be are the glue that anchors a healthful diet and lifestyle together. These events give us the inspiration to continue and to make positive choices. I created the recipes in the appendix with a desire to provide as many nutrients, vitamins, and minerals as possible while ensuring flavor and variety as well. I hope they're as fun for you to make as they are delicious to eat.

May you enjoy each of my recipes with pleasure and health!

About This Book

This new and revised edition of *Diabetes For Dummies* builds on the widely respected and successful previous editions with a new approach.

We describe the latest medical treatments in their relevant chapters. There continues to be considerable progress made toward understanding the underlying causes of diabetes, and in particular, there's a greater understanding of the links between diabetes, the chronic diseases that complicate diabetes, and the role of chronic inflammation. Diet, exercise, and perhaps other aspects of the way we live can certainly affect the degree to which chronic inflammation impacts our bodies, and so we certainly have some control over our lives, whether diagnosed with any of these conditions or are apparently healthy.

This book takes a much more holistic look at diabetes, not just as an illness that may have medical treatments but also as it relates to our lives and communities. We also embrace ideas of health being integral to our mind and spirit as well as our bodies and discuss therapies and ways of living that are often omitted from books about medical conditions.

The new edition can be used as a general resource for anyone desiring to understand the latest on diabetes or as a faithful companion to someone who is living with the disease or newly diagnosed. We recommend flipping through the chapters to read what is most beneficial to you. If you're newly diagnosed, have been misinformed, or are just learning about diabetes, it would be beneficial to read it from cover to cover at your leisure.

Most importantly, remember that as you make a decision to take care of your health, once you get started, it will be easier than you may think. The emotional and psychological benefits of fresh air, exercise, eating well, and so on soon become addictive, and you'll find yourself craving more. There's no need to do

everything all at once. We recommend starting slowly and implementing new, positive actions as often as is comfortable for you. You may choose to swap out some unhealthy food choices for better ones from this book. Let that be your only change for a week. The following week, you may choose to add exercise, and the week after that, you may commit to learning to cook so that you can make more nutritious meals for yourself.

The good news is, the more you do, the more empowered you'll feel. Every good change, no matter how small, will add up over time. We can't stress enough the importance of learning how to cook at home, or in committing to cook more if you don't already do so. Cooking skills are the foundation of a healthful diet because they give you the tools to create nutritious food for yourself when you need it. Most importantly, try to use this, and your diagnosis, as an excuse as well as a guide to living your best life. Many modern societies aren't created to keep people in top shape, and it's easy to become consumed in work, commitments, and schedules. Sometimes an illness can help you prioritize yourself and your needs. Let this book inspire you to give yourself the gift of good health. You and everyone around you will benefit from this courageous commitment.

Foolish Assumptions

This book assumes that you know nothing about diabetes, so you won't have to face a term that you've never heard of before and that isn't explained. For those who already know a lot about diabetes, you can find more in-depth explanations in this book as well. You can pick and choose how much you want to know about a subject, but the key points are clearly marked.

You may assume that if you or a loved one has been diagnosed with diabetes that there is not much you can do about it. Each chapter will help you to develop a positive and proactive approach to living, and flourishing, with diabetes.

Icons Used in This Book

The icons alert you to information you must know, information you should know, and information you may find interesting but can live without.

REMEMBER

When you see this icon, it means the information is essential and you should be aware of it.

TIP

This icon marks important information that can save you time and energy.

FROM THE AUTHORS

We use this icon whenever we tell a story based on our personal experience.

ASK THE DOCTOR

This icon is used to help you with medical advice about the choices you have to optimize your treatment.

TECHNICAL STUFF

This icon gives you technical information or terminology that may be helpful, but not necessary, to your understanding of the topic.

WARNING

This icon warns against potential problems (for example, if you don't treat a complication of diabetes properly).

Beyond This Book

In addition to the content of this book, you can access some related material online. We've posted the Cheat Sheet at `www.dummies.com`. It contains important information that you may want to refer to on a regular basis. To find the Cheat Sheet, simply visit `www.dummies.com` and search for **Diabetes For Dummies cheat sheet**.

On the website, you can find many other articles related to healthy living and diabetes that can help you navigate this medical condition. Just search for the topic that interests you, and the results will return all related content.

Where to Go from Here

Where you go from here depends on your needs. If you already have basic knowledge of diabetes and want to know more about complications, go to Chapter 3. If you're a novice, start at Chapter 1. If you want to know more about the medications you're taking, go to Chapter 8. Chapter 11 helps you determine the

type of exercise you should be doing. Each chapter title clearly tells you what you can find there, so check the table of contents to find what you need rapidly.

REMEMBER

As you'll find out, keeping a positive attitude and finding some humor in your diabetes can help you a great deal. At times, you may feel like doing anything but laughing, but scientific studies are clear about the benefits of a positive attitude. In a very few words: Those who laugh, last. Another point is that people learn more and retain more when humor is part of the process.

If you'd like helpful, general information fast, head to Part 5 to check out the "Ten Commandments for Excellent Diabetes Care" and the "Ten Myths about Diabetes That You Can Forget." Refer to Chapters 8, 9, and 10 for diet, nutrition, and meal-planning strategies. The appendix contains recipes that will help keep your glucose levels under control while providing flavorful inspiration for meal time.

1 Understanding Diabetes

IN THIS PART . . .

Find out how diabetes affects the person living with diabetes as well as other people in that person's life.

Deal with the diagnosis of diabetes so you can take appropriate action with your doctor to create a treatment and plan.

Obtain an in-depth understanding of the definition of diabetes so you can determine the severity of your condition.

Clarify the types of diabetes to form a foundation for your understanding of the various treatment options.

Understand the role of glucose and hemoglobin A1C.

IN THIS CHAPTER

- Reducing the stigma of diabetes
- Understanding how diabetes affects us
- Coping with the initial diagnosis
- Living your best life

Chapter 1
How Diabetes Affects Us All

Today, 415 million people worldwide are living with diabetes. By 2040, more than half a billion people are expected to have diabetes. Despite the fact that diabetes rates continue to spike around the world, the topic is often avoided due to stigmas associated with having the condition. In the United States, it's estimated that one in two adults currently have either diabetes or prediabetes. So this book is relevant not only to health care professionals, or those with diabetes and their caregivers, but to everyone.

This chapter discusses the importance of reducing the stigma of diabetes in society. If you've been diagnosed with diabetes, it doesn't affect just you. How you deal with the disease affects your family, friends, and coworkers. This chapter also shows you how to cope with diabetes and how to understand its impact on your important relationships. Best of all, we share easy and effective tips for living your best life.

Finding Hope and Success Amid a Diabetes Diagnosis

With diabetes rates as high as they are, everyone you know will likely be affected by it in some form at some point in their life. Many of us have close personal ties with people with diabetes but aren't involved with their care on a daily basis. Even though the diabetes statistics are startling and the topic conjures up all kinds of horrible images for many, there is hope.

KNOWING YOU'RE NOT ALONE

If you have diabetes, you're not alone. You may not even be aware of some of the world-renowned figures who live with diabetes every day, just like you. Their success on the world stage exemplifies why diabetes doesn't need to prevent you from accomplishing your goals.

Here are just a few celebrities that you may recognize:

- **Halle Berry:** The American model turned actress was diagnosed with diabetes at the age of 22 and, at the time of writing this book, is now 55 years old and enjoying the time of her life, thanks to diet and exercise.
- **Tom Hanks:** This actor has played numerous roles, including *Captain Phillips* and *Saving Mr. Banks,* since he was diagnosed with type 2 diabetes in 2013. Diabetes hasn't slowed his career at all. In addition to acting, he also produces, directs, and writes screenplays.
- **Patti Labelle:** This American soul singer and actress has won two Grammy awards during her career — the first for her tenth album, *Burnin',* and the second for her *Live! One Night Only* album in 1998. She was diagnosed with type 2 diabetes in 1995 after she passed out on stage during a performance in New York City. LaBelle's mother died from diabetes-related complications, so LaBelle adopted a healthful lifestyle after her diagnosis.
- **Wendell Pierce:** If you enjoyed *The Wire* on TV, you enjoyed watching this actor, who played Detective Bunk Moreland. He has been in more than 30 movies and has played many roles on TV, including *Treme.* Pierce has tried to help others with his disease by starting a chain of groceries that sell quality food in low-income areas.
- **Sharon Stone:** No one could say that this actress with type 1 diabetes has failed to obtain any roles or to play them with the greatest skill.

People with diabetes also successfully perform in every professional sport. (To read about the role of sports and exercise in your life, see Chapter 10.)

- **Football:** Kyle Love of the Carolina Panthers and Jake Byrne, who played with the San Diego Chargers, are football players who don't let their diabetes slow them down. Love has type 2 diabetes, and Byrne has type 1 diabetes.
- **Baseball:** Sam Fuld plays baseball for the Oakland Athletics, and Brandon Marrow plays baseball with the San Diego Padres.
- **Basketball:** Gary Forbes plays basketball for the Toronto Raptors, and Adam Morrison recently retired from professional basketball after playing for the Los Angeles Lakers and the Charlotte Bobcats.

If you think that diabetes may prevent you from a career in the sciences, just consider these modern-day researchers with diabetes who perform at the highest level in every field:

- **David Cummings, MD:** A professor at the University of Washington, he is exploring the place of metabolic surgery in type 2 diabetes.
- **Martin Gillis, DDS:** He is clarifying the effect of diabetes on the oral cavity.
- **Nicholas Mayall:** He added to science's knowledge of nebulae, supernovae, spiral galaxies, and the age of the universe, and he's in no way limited by his diabetes.

REMEMBER

The very good news is that diabetes, especially type 2 diabetes, can be reversed. The body can heal itself with the proper treatment. A delicious and diabetes-friendly diet, pleasurable physical activity, lifestyle enhancements, and (at times) pharmaceutical drugs can help someone who has just been diagnosed feel better than before. Each person's body, mind, and consciousness works differently, so finding the right formula to keep you and your loved ones healthy may require different levels or types of effort.

Changing attitudes about diabetes

FROM THE AUTHORS

From Dr. Simon Poole: A patient recounted the following: "The hardest thing about having diabetes is having to deal with doctors who do not respect me." Several times over the years, she had followed her doctor's recommendations exactly, but her glucose control hadn't been satisfactory. The doctor blamed her for this "failure."

Shame, and even blame, are a common experience for patients diagnosed with diabetes. These ideas are made worse by a perception of an ideal body image that

has been promoted by media and advertising. This can create significant barriers to patients looking for help and support. Often when people disengage from treatment, doctors interpret the situation as a lack of self-care or an "irresponsible" disregard for the consequences, but it's much more likely because of an unspoken and complex fear of judgment. People who feel less able to express themselves in a confident way may be disproportionately affected by the stigma surrounding the disease, which perpetuates health inequalities. Doctors, therapists, friends, and colleagues can help by being aware of these issues and also considering their own sometimes unconscious biases and prejudices.

FROM THE AUTHORS

From Amy Riolo: If I had a magic wand, I'd remove all the negative connotations associated with people with diabetes as well as the misconceptions and the myths that are obstacles to healing. Over decades of educating both doctors and patients about functional and behavioral strategies to help reduce diabetes rates and transform the health of those afflicted with it, I find that the same stigma exists today as when I started.

Ten years ago, I was a part of a panel discussion with endocrinologists who were trying to address the issue, but little has changed since then, despite our efforts. As a result, I'd like to remind everyone that diabetes is no more a part of a poor diet or lifestyle than any other disease or illness is. Many conditions (heart disease, high blood pressure, cholesterol levels, strokes, and so on) can be helped or avoided with the proper lifestyle and diet. Thankfully, most people don't judge those who have been victims of heart attacks or strokes. Unfortunately, those with diabetes aren't given the same consideration, and they face a lot of judgment and shame.

This deep embarrassment that diabetes-sufferers have toward their condition prevents them from speaking about it. When I proposed an idea during the panel discussion to have restaurant menus and food packaging contain diabetes-friendly info, diabetes patients told me that they wouldn't order those menu items, even if they were available. They said they would be ashamed to discuss their diagnosis with "well-meaning" diners who would start giving them advice on how they should change their life.

So after further consideration, the first step needs to be to create awareness around diabetes and to foster an environment of respect and understanding around the disease so that those who suffer from it are able to comfortably have their dietary needs met. Any physical symptom or ailment that people experience is just the body's way of communicating, and because we all are afflicted with different ailments at various times in our lives, we should show compassion and dignity both to ourselves and one another.

Considering key quality-of-life factors

If someone who you care for has been diagnosed with diabetes, this book will provide you with the tools necessary to help them live better, while giving you an understanding of what they're going through. Keep in mind that the following key factors play a great role in the life of someone attempting to balance their blood sugar:

- **Family support:** People with diabetes greatly benefit from their family's help in dealing with their disease. A review of 26 studies that assessed the effect of family-based interventions was published in the *Annals of New York Academy of Sciences* in 2015 and concluded there were improvements in diabetes knowledge, measurements of parameters of self-care, and also the perception of social support among adults with diabetes. Encouraging the involvement and engagement of family and friends in the care of an individual can make a significant positive contribution to their experience of living with and managing their diabetes. Chapter 13 gives more ideas on this topic in detail.
- **Quality of life over the long term:** How does a person's perception of quality of life change over time? As they age, do most people with diabetes feel that their quality of life increases, decreases, or persists at a steady level? The consensus of several studies is that most people with diabetes experience an increasing quality of life as they get older. People feel better about themselves and their diabetes after dealing with the disease for a decade or more. This report shows the healing property of time.

Embracing the Opportunity for Change

By the time you're diagnosed with diabetes, you probably have already suffered from insulin resistance for years or even decades, so the onset of diabetes isn't instantaneous. Getting the proper treatment and adjusting your lifestyle accordingly isn't a consequential punishment; it's an opportunity to live and eat in ways that may have you looking and feeling better than ever before. Think of your diagnosis as a permission slip to dedicate more time to yourself and the things that you enjoy in life. Fortunately, many tips, therapies, and strategies that you may have never even heard of can help you enjoy the life that you want.

Understanding is empowerment

How you choose to deal with your health care determines whether you heal, learn to manage your diabetes, or advance to long-term complications. A diabetes

diagnosis can be a warning that can help you get back on track with your health. You may already be incorporating some great habits in your lifestyle. Having a diabetes diagnosis doesn't mean that those aren't working; it's simply a sign that some additional modifications may be required.

If you have diabetes, in the course of a year, you live with that diagnosis for about 8,760 hours. During that time, you spend perhaps only one hour with a physician. In Chapter 12, we introduce you to many of the other people who may help you manage or transform your disease diagnosis. Equipped with these resources, you should feel empowered to make positive progress in your health. Your goal may simply be to balance your blood sugar, but on the path to doing that, you may improve many other conditions that have caused pain and discomfort over the years.

Dealing with the common emotions among diabetes patients

The following sections describe the normal stages of reacting to a diagnosis of a major medical condition such as diabetes. While very normal and typical, these emotions are partly due to fear that is fueled by misinformation about diabetes. Remember that a diagnosis isn't permanent, that blood sugar changes all the time, and you absolutely can still achieve optimal health, if that is your goal.

Experiencing denial

A denial mindset is common among people when they first learn that they have diabetes. Many patients look for any evidence that the diagnosis is a mistake. Perhaps they even neglect to take medication, follow their diet, or perform the exercise that is so important to maintaining a healthy body and mind. But ultimately, if you'd like to thrive, you have to acknowledge the diagnosis and begin to gather the information you need to help yourself.

REMEMBER

There's a difference between acknowledging your diagnosis, informing yourself on what to look for and how to treat yourself, and identifying with the illness. Regardless of what you've been diagnosed with, you can make up your mind that the disease won't define you. You may suffer from diabetes, and you can be highly proactive in doing everything needed to be healthy, but you don't need to define yourself only by the diabetes. Acknowledging the diagnosis, choosing the best treatment, and maintaining the best lifestyle and diet while thinking of yourself as on the road to wellness (or already being healthy) will yield much better results than mentally identifying yourself with an illness will.

Keeping a healthy and positive mindset can be challenging when sharing the news with your family, friends, and people close to you. Having diabetes isn't

something to be ashamed of, and you shouldn't hide it from anyone. Know in advance that people may give you unsolicited and sometimes inaccurate advice. Resist the urge to feel offended or defensive if this happens. That type of behavior, while it can be hurtful, may simply be a result of uninformed or misinformed individuals who care about you.

REMEMBER

Keep in mind that you need the help of everyone in your community (see Chapter 19): your coworkers who need to know not to tempt you with treats that you can't eat; your friends who may need to know how to give you glucagon (a treatment for low blood glucose) if you become unconscious from a severe insulin reaction (see Chapter 4); and your family who needs to know how to support and encourage you to keep going.

Everyone should also be equipped with healthy tips and strategies that they can do to help you stay on track. Instead of listening to unsolicited suggestions from someone who has no experience with diabetes (but cares about you and has good intentions), for example, offer them a "to-do list." Say, "Thank you so much for being concerned about my health. My doctor really encourages me to walk (or name your other favorite activity) more; I would love to do that with you." Or "Taking naps is really good for my blood sugar levels. Could you do *x* so that I can take a 15-minute nap daily?"

Feeling anger

When you pass the stage of denial, you may become angry that you're saddled with this "terrible" diagnosis, but you'll quickly find that diabetes isn't so terrible and that you can do something to rid yourself of the disease. Anger only worsens your situation, and being angry about your diagnosis is detrimental in the following ways:

- If your anger becomes targeted at a person, they are hurt. This is sometimes described as "projection" of your negative emotions.
- You may feel guilty that your anger is harming you and those close to you.
- Anger can prevent you from successfully managing your diabetes.
- All negative emotions can be detrimental to your health in general.

Finding motivation to make changes

From an energetic standpoint, anger is mobilizing. In the short term, a thought or idea that makes you angry gives you energy. It requires more energy to be angry than it does to be, say, depressed, which is why anger always follows an initial trauma response of denial. Use that short burst of energy to motivate yourself to

do the positive actions that can help your health. Instead of being angry and stopping or doing something that derails your diet or lifestyle, for example, say, "Because I hate this diagnosis, I am going to do everything I can to regain my good health." When the anger comes back up, repeat the process as necessary. Exercise, meditation, laughter, and good company will all help put you in a better mood.

TIP

As long as you're angry, you're not in a problem-solving mode. Actually, it's very difficult to transform an illness if you're angry about it. Many mental therapists work on helping their patients accept the hidden blessings in their illness as a means of being at peace. This is often the last step in complete healing. If you can come to a peaceful view about your disease, it can more easily leave your body.

You may be wondering, "What is there to be grateful for in a diabetes diagnosis?" That question is very common and logical, and the answer is different for everyone. In general, illnesses

- Give you the opportunity to focus inward (something that modern society makes difficult)
- Give you an excuse to spend more time on yourself (many people feel guilty if they aren't constantly doing for others)
- Enable you to ask for help (people are often very independent, but an illness makes it necessary to enlist the assistance of others)

The answers to each of these questions hold hidden gems of knowledge that mentally help the body perform better.

Giving yourself time to adjust

The stage of anger often transitions into a stage when you become increasingly aware of the implications of the diagnosis. Even though you probably realize that you have plenty of life ahead of you, you may feel overwhelmed by the talk of complications, blood tests, and pills or insulin. When you realize that bargaining doesn't work, you may even experience depression, which makes good diabetic care all the more difficult.

WARNING

Studies have shown that people with diabetes suffer from depression at a rate that is two to four times higher than the rate for the general population. People with diabetes also experience anxiety at a rate three to five times higher than people without diabetes. The mind and the body are connected, so making sure that your thoughts and emotions are positive will help your body metabolize insulin better along with many aspects of your physical health. Having a professional therapist can be an excellent resource to help you feel your best. See Chapter 12 for types of therapies that may work for you.

How do you fend off depression? Following are a few important methods:

- Try to achieve excellent blood glucose control (see Part 3).
- Begin a regular exercise program (Chapter 10).
- Tell a friend or relative how you're feeling — get it off your chest (Chapter 19).
- Recognize that every abnormal blip in your blood glucose isn't your fault (Chapter 7).
- Look for reasons to feel good. When you wake up in the morning, make it your dominant goal to feel your best.
- Watch your mental diet. What you think about or watch or listen to is every bit as important as the food that you fuel your body with. Choose upbeat, happy, positive thoughts, programming, and music as much as possible.
- Practice deep breathing, yoga, prayer, or meditation to improve your mood, sleep, and blood sugar levels.

Taking back control

You may experience the various stages of reacting to your diabetes in a different order than we describe in the previous sections. Some stages may be more prominent for you, and others may be hardly noticeable.

REMEMBER

Don't think that any feelings of anger, denial, and depression are wrong. They're natural coping mechanisms that serve a psychological purpose for a brief time. Allow yourself to have these feelings — and then drop them. Choose other thoughts that feel better to you — including the way in which you choose to think about your current health situation — and think positively as much as possible. Move on and discover how to live normally.

REMEMBER

These phases of coping may not occur in the order given, may not occur at all, and/or may last a long time. If one phase inhibits your ability to cope with your diabetes for more than a few months, you may need outside help. Chapter 13 discusses putting together a team of professionals to help you feel your best. You may need outside help from a professional who has expertise in the impact of a physical illness on mental health, such as a mind-body therapist or another mental health professional of your choice.

Keep doing the things we suggest in Chapter 4, and you'll be very gratified at the end.

Maintaining a High Quality of Life

You may assume that a chronic disease like diabetes leads to a diminished quality of life, but you don't have to settle (refer to the sidebar "Knowing you're not alone," earlier in this chapter). Many studies have evaluated the quality-of-life question, and the following sections describe not only what these studies found but also our hope that you can take control and ensure that you maintain a high quality of life.

Practicing positivity and enjoying yourself

Here are some key steps you can take to manage the emotional side of diabetes:

- **Focus on your successes.** Some things may go wrong as you find out how to manage diabetes, but most things will go right. As you concentrate on your successes, you'll realize that you can cope with diabetes and not let it overwhelm you. Make a journal each night of all the good things that happened that day.
- **Involve the whole family in your diabetes.** A diabetes-friendly lifestyle is a healthy lifestyle for everyone. For instance, the exercise you do is good for the whole family. By doing it together, you strengthen family ties while everyone gets the health benefits. Also, should you need your family to help you, for instance, during a particularly severe case of low blood glucose, their early involvement in learning about diabetes will give them the peace of mind to know they're helping you, not hurting you. (See Chapter 19 for ways to enlist help from people around you.)
- **Develop a positive attitude.** A positive attitude gives you a can-do mindset and better health, whereas a negative attitude leads to low motivation, which can prevent you from doing all that's necessary to manage your diabetes. The quickest way to a better mood is gratitude. Make a list of what you're grateful for each day and read it when you're upset.
- **Find a great team, pinpoint problems, and set goals.** Determine the most difficult problems that you have with your diabetes and then consider how you can solve them by yourself or with a great team of supporting players like a primary care physician, a diabetes specialist, a diabetes educator, a dietitian, an eye doctor, a foot doctor, and so forth. Set realistic goals to get past your problems. (Chapter 12 tells you everything you need to know about getting help from the supporting players.)

» **Don't expect perfection.** Although you may feel that you're doing everything right, you may experience blood glucose levels that are too high or too low. This uncontrollable situation happens to every person with diabetes, and it's one of the biggest frustrations of the disease. Don't beat yourself up over something you can't control.

Exercising regularly

TIP

In one long-term study, a factor that contributed to a lower quality of life rating was a lack of physical activity, which is something you can alter immediately. Physical activity is a habit that you must maintain on a lifelong basis. (See Chapter 10 for advice on exercise.) The problem is that making a long-term change to a more physically active lifestyle is difficult; most people become more active for a time but eventually fall back into inactive routines.

People who do regular exercise often describe it as addictive. They find it so pleasurable that they look forward to the next session. And the benefits for the person with diabetes are enormous, including improved tone, better balance, weight loss, and less depression and anxiety What kind of movement gives you joy? Do that!

Creating a pro-health schedule

One of the best ways to create a schedule that supports your well-being is to make sure that you schedule something joyful into your calendar every day. We all have factors that may be difficult to change, such as work or medical appointments, for example. Scheduling in time for physical activity, getting fresh air and enough sleep (including naps, if possible), and time to prepare healthful meals will pay off in your quality of life, mood, blood sugar levels, and overall health.

When many people decide to make healthier lifestyle commitments, they often take on an "all or nothing" attitude, which can be difficult to maintain. When scheduling good-for-you activities, make sure that you're being realistic with your calendar. On the days that you work longer, you may need shorter workouts, time outdoors, or naps. Try to think in intervals of 10 minutes and in getting the most bang for your buck. If you can schedule only 30 minutes a day to work toward a healthier life, you could spend 10 minutes walking outdoors, 10 minutes meditating or napping, and another 10 minutes whipping up something satisfying to eat. In the course of a month, those three little 10-minute interludes will have already begun to make a difference. Use your days off to enjoy more physical exercise, relaxation, and meal prep for the busier days.

Processing emotions

Scores of studies show that lowering stress lowers blood glucose. In one specific study published in *Diabetes Care Magazine* in 2002, patients were divided into two groups, one of which received diabetes education alone and the other received diabetes education plus five sessions of stress management. The latter group showed significant improvement in diabetic control versus the former group.

TIP

Whether stress raises the blood glucose directly by causing the release of stress hormones or raises it indirectly by causing overeating, underexercising, and failure to take medications, managing stress certainly contributes to managing your diabetes. Here are some of the things you can do to help manage stress in your life:

- **Identify the source of the stress.** Are you adding stress yourself by accepting it as an unchanging part of your life or blaming others or outside events that you can't control?
- **Examine the way that you cope with stress now.** Do you smoke, drink too much, overeat, spend too much time in front of screens, sleep too much, or overschedule yourself so you have no time?
- **Replace unhealthy coping mechanisms with healthy ones.** Avoid the stress you've identified or make a change in your life. Adapt to the stress or accept it. You can't avoid your diabetes, but you can make it less stressful by following our recommendations in Part 3.
- **Take time for fun and relaxation.** Here are some of the things you may do:
  - Have a picnic lunch.
  - Get a massage.
  - Take a long bath.
  - Work in a garden.
  - Play with a pet or go to the zoo.
  - Listen to your favorite music.
  - Go to a comedy show or rent a funny movie.
  - Take a nap.
  - Go for a walk or run.
  - Meditate.
  - Stay in bed with your significant other.
- **Monitor blood glucose levels.** Keep your blood glucose as normal as possible (see Part 3 for tips).
- **Pursue continuing education.** Stay aware of the latest developments in diabetes care.
- **Keep your attitude positive.** Maintain a healthy attitude. Remember that someday you'll laugh about things that bug you now, so why wait?

WHEN YOU'RE HAVING TROUBLE COPING

You may not hesitate to seek help for your physical ailments associated with diabetes, but you may be reluctant to seek help when you can't adjust psychologically to diabetes. The problem is that sooner or later, your psychological maladjustment will ruin any control that you have over your diabetes. And, of course, you won't lead a very pleasant life if you're in a depressed or anxious state all the time. The following symptoms are indicators that you're past the point of handling your diabetes on your own and may be suffering from depression:

- You can't sleep or you sleep too much.
- You have no energy when you're awake.
- You can't think clearly.
- You can't find activities that interest or amuse you.
- You feel worthless.
- You have frequent thoughts of suicide.
- You have no appetite.
- You find no humor in anything.

If you recognize several of these symptoms in your daily life, you need to get some help. Your sense of hopelessness may include the feeling that no one else can help you, but that's simply not true. First, go to your primary physician or endocrinologist (diabetes specialist) for advice. They may help you to see the need for some short-term or long-term therapy. Well-trained therapists — especially therapists trained to take care of people with diabetes — can see solutions that you can't see in your current state. You need to find a therapist whom you can trust so that when you're feeling low you can talk to this person and feel assured that they're interested in your welfare.

Your therapist may decide that you'd benefit from medication to treat the anxiety or depression. Currently, many drugs are available that are proven safe and free of side effects. Sometimes a brief period of medication is enough to help you adjust to your diabetes.

You can also find help in a support group. The huge and continually growing number of support groups shows that positive things are happening in these groups. In most support groups, participants share their stories and problems, helping everyone involved cope with their own feelings of isolation, futility, or depression.At the time of writing this book, `https://diabeteseducator.org/` and `https://diabetes.org/` offer resources for virtual and in-person support.

IN THIS CHAPTER

- Understanding how glucose works in the body
- Identifying chronic high blood glucose with the hemoglobin A1C
- Reviewing the warning signs of prediabetes
- Testing for diabetes
- Understanding the diabetes epidemic

Chapter 2

Making the Diagnosis with Glucose and Hemoglobin A1C

A diabetes diagnosis can be scary, but learning about hemoglobin A1C levels and glucose and what effects them will enable you to take control of your health and life. This new heightened awareness, when countered with positive lifestyle changes, can enable you to feel even better than you did before their diagnosis.

This chapter explains the warning signs for diabetes, the tests that are helpful for diagnosis and monitoring, and the facts about prediabetes. We talk about the evolution of the obesity and diabetes epidemics.

Understanding Energy, Glucose, and the Importance of Balance

Creating energy through chemical reactions is essential for life. To breathe, move, think, and engage in the world around you, you need to find and process this energy from the foods you eat. Macronutrients, which are the three food components in the largest quantity in our diet, are in the form of carbohydrates, fats, and proteins.

Carbohydrates are found in simple, readily available small molecular forms called sugars or are linked together in more complex carbohydrates. Although your body can break down fats and proteins (which are essential for the structure of your cells as well as serving other purposes) to create energy as well, carbohydrates in their simple or complex forms are the go-to nutrients for easily accessed fuel for living. The human brain in particular is a big consumer of glucose.

Glucose is the commonest type of simple sugar. Fructose and sucrose (which is a combination of the glucose and fructose) are examples of other simple sugars. Complex carbohydrates contain multiple different sugar molecules bound together, are "locked in" the larger chemical structure of foods (the food matrix) and need to be broken down to release the simpler molecules for energy.

Simple sugars are present naturally in varying amounts in fruits, milk, and honey, for example, and they taste sweet. Research has shown that a sugar-rich meal can set off pleasure responses in the "reward centers" in the brain. Consequently, some scientists view sugar as being an addictive substance, the enjoyment of which is hard-wired, with increasing consumption leading to greater craving. The reasons for sugar being so attractive are probably because we've evolved living in environments where food was scarce and sweetness was an indicator of valuable edible energy. The drive for sugar may well have been useful to our distant ancestors. And the production by some plants of sugars in their fibrous and nutrient-rich fruit has always attracted animals to eat and distribute the seeds in one of the smartest deals ever devised.

Humans have adapted to respond to a natural diet where food was sometimes scarce and where most of the carbohydrates consumed were complex carbohydrates or sugars from fruit and vegetables. Our bodies can very efficiently process the nutrients we eat and manage the levels of glucose circulating, including after a meal, so we have exactly the right balance of readily available energy for immediate use and stored energy for later use. This fine-tuning works with amazing accuracy in an environment in which we have evolved to survive. When sugar availability and consumption greatly exceed those levels, however, problems can

occur. We have not yet adapted to the 100 pounds per year per person of added high fructose corn syrup and table sugar (sucrose) that the average American consumes in a year.

In a relatively short space of time, our increasingly large-scale, industrial method of food production has led to manufacturers learning to refine and add sugars to products. Repeat sales are driven by the habitual sensory reward people may experience from these foods. These added sugars in processed foods have resulted in unprecedented amounts of sugar in our diets.

REMEMBER

For many years, scientists have debated the role of sugar in the causation of diabetes. Now the evidence seems conclusive. Too much sugar leads to diabetes. In a study of 175 countries, increased sugar in the food supply was linked to higher diabetes rates, regardless of obesity.

- The greater the level of sugar in the food supply, the higher the level of diabetes.
- The longer a high level of sugar persisted in the food supply, the higher the level of diabetes.
- The incidence of diabetes decreases as the sugar in the food supply decreases.
- Increased consumption of sugar precedes diabetes.

How much sugar is too much? Researchers haven't established this amount, but the U.S. Department of Agriculture recommends no more than 10 teaspoons of added sugar (sugar not normally found in fruits, vegetables, and dairy) per day Just one can of soda has that much added sugar. Most Americans eat more than twice that amount, and it is often difficult to recognize the presence of sugar in processed foods.

Understanding how your body handles glucose

To understand the symptoms of diabetes, you need to know a little about the way the body normally handles glucose and what happens when things go wrong. A hormone called *insulin* finely controls the level of glucose in your blood. A hormone is a chemical substance made in one part of the body that travels (usually through the bloodstream) to a distant part of the body where it performs its work. In the case of insulin, that work is to act like a key to open a cell (such as a muscle, fat, or liver cell) so that glucose can enter. If glucose can't enter the cell, it can't provide energy to the body.

Insulin is the major player in regulating your sugar level. Especially when you eat, your body responds with insulin to control the amount of circulating glucose, keeping things in balance as you consume food and utilize energy to live. Insulin promotes storage of glucose in the form of fats when there is excess and contributes to the release of glucose when energy is needed.

REMEMBER

Insulin is essential for growth. In addition to providing the key to glucose entering the cell, insulin is considered the builder hormone because it enables fat and muscle to form. It promotes the storage of glucose in a form called glycogen for use when fuel isn't coming in. It also blocks the breakdown of protein. Without insulin, you don't survive for long.

Your body keeps the level of glucose pretty steady at about 60 to 100 mg/dl (3.3 to 6.4 mmol/L) all the time. Your glucose starts to rise in your blood when you don't have a sufficient amount of insulin or when your insulin isn't working effectively (see Chapter 3).

When your glucose rises above 180 mg/dl (10.0 mmol/L), glucose begins to spill into the urine and make it sweet. Mg/dl, or milligrams per deciliter, is the unit of measurement commonly used in the United States. The rest of the world uses the International System (SI), where the units are mmol/L, which means millimoles per liter. To get mmol/L, you divide mg/dl by 18. Therefore, 200 mg/dl equals 11.1 mmol/L.

Up to that point, the kidneys (the filters for the blood) are able to extract the glucose before it enters your urine. The loss of glucose into the urine leads to many of the short-term complications of diabetes including dehydration, ketosis and others. (See Chapter 4 for more on maintaining optimal health.)

Understanding HBA1C — your personal monitor

Your *blood glucose level* is the level of sugar in your blood, a key measure of diabetes. Individual blood glucose tests are great for determining how you're doing at a particular moment and what to do to make it better, but they don't give the big picture. They capture just a moment in time. Glucose can change a great deal even in 30 minutes, especially before or after meals. What you need is a test that gives an integrated picture of many days, weeks, or even months of blood glucose levels. The test that accomplishes this important task is called the *hemoglobin A1C* — often shortened to HBA1C or simply A1C.

Hemoglobin is a protein that carries oxygen around the body and drops it off wherever it's needed to help in all the chemical reactions that are constantly taking

place. The hemoglobin is packaged within red blood cells that live in the bloodstream for 70 to 140 days. As the blood circulates, glucose in the blood attaches to the hemoglobin in several different ways and stays attached. The total of all the hemoglobin attached to glucose is called glycohemoglobin, which normally makes up about 6 percent of the hemoglobin in the blood. Two-thirds of the glycohemoglobin is in the form called hemoglobin A1C, and it's the easiest to measure.

The more glucose in the blood, the more glycohemoglobins form. Because red blood cells carrying glycohemoglobin remain in the blood for two to three months, glycohemoglobin gives an average of the glucose control over the last two to three months and not just the moment that a single glucose test reflects.

Hemoglobin A1C can be used to identify the presence of diabetes in people who may be unaware they have the condition. According to one study, in the United States, hemoglobin A1C detects that diabetes is present in one in every five people who don't already have a diagnosis of diabetes, regardless of the reason they're admitted to a hospital.

Hemoglobin A1C is not only used to monitor the control of diabetes, but it has now become the most commonly used and simplest way to diagnose diabetes. Although some people are first diagnosed when presenting with symptoms or a high blood sugar level, many are found to have diabetes through HBA1C screening.

Hemoglobin A1C is now as well standardized as glucose testing, and it has the following benefits:

- A1C reflects chronic high blood glucose rather than a few seconds in time.
- A1C has been found to reflect future complications (see Chapter 5) better than fasting glucose, which is one measure of tendency toward diabetes that is the minimum level that your sugar level gets to when you haven't eaten. People with diabetes have a higher fasting glucose reading. In those without diabetes, the number continues to go down, but if someone has diabetes, the number will always be slightly higher because there is a high circulating sugar level.
- Fasting isn't necessary, and acute changes like diet and exercise don't affect A1C.
- A1C isn't as affected by sample delays on the way to or in the lab.
- A1C is also used to follow the course of diabetes, so the level of treatment needed is immediately understood. Higher A1C levels denote poorer control of diabetes and greater risk of complications.
- A1C is cost-effective, because no further testing is immediately necessary when results are abnormal (whereas an abnormal glucose test requires another glucose or A1C as the next test).

In terms of diagnosing diabetes, hemoglobin A1C has a number of advantages over a variety of other glucose tests, which we discuss later in this chapter in "Diagnosing diabetes through testing."

- Abnormal glucose after eating is a better predictor of heart disease than A1C.
- Some subjects with anemia, a recent blood transfusion, and abnormal hemoglobin types produce an unreliable A1C result.
- Different ethnic groups have different levels for their abnormal A1C.

Hemoglobin A1C levels can also empower a person to set targets and see measurable changes in their diabetes control and risk of complications when they make positive lifestyle changes.

Getting a Wake-Up Call from Prediabetes

Diabetes doesn't suddenly appear one day without your body having raised some red flags. For a period of time, which may last up to ten years, you may not quite achieve the criteria for a diagnosis of diabetes but not be quite normal either. During this time, you have what's called *prediabetes* or *impaired glucose tolerance.*

A person with prediabetes doesn't usually have any symptoms or develop eye disease, kidney disease, or nerve damage (all potential complications of diabetes, which we discuss in Chapter 5). However, a person with prediabetes has a much greater risk of developing heart disease and strokes than someone with entirely normal blood glucose levels and may be on a path to develop full-blown diabetes.

Prediabetes is a result of insulin-resistance syndrome of a certain level. Metabolic syndrome describes a combination of prediabetes with high blood pressure, obesity, and high cholesterol, which we discuss in Chapter 5. Insulin resistance is an increasingly widespread condition that can lead to prediabetes. There is more information on insulin resistance in Chapter 3.

REMEMBER

Prediabetes doesn't inevitably lead to a later diagnosis or symptoms of diabetes. A person may adopt a healthier lifestyle and receive the good news that tests confirm they have returned to normal range.

Knowing when you should get tested

People with symptoms of diabetes (see the "Recognizing the symptoms of diabetes" section later in this chapter) should definitely get tested by their doctor.

However, because so many people have diabetes or prediabetes without knowing it or showing symptoms, testing for prediabetes is a good idea for everyone over the age of 45. It also may be recommended to get tested if you're under 45 and overweight or eat more than ten teaspoons of added sugar daily and have one or more of the following risk factors:

- You're in a high-risk groups: African-American, Latino, Asian, or Native American.
- You have high blood pressure.
- You have low HDL ("good" cholesterol).
- You have high triglycerides.
- You have a family history of diabetes.
- You experienced diabetes during a pregnancy or gave birth to a baby weighing more than 9 pounds.

REMEMBER

It has been estimated that prediabetes will progress to overt diabetes in approximately 25 percent of people within three to five years, and as many as 70 percent of individuals with prediabetes will develop overt diabetes within their lifetime. However, more recently, it has been shown that adopting lifestyle changes can significantly improve a person's chances of not developing diabetes. The global prevalence of prediabetes was estimated at 7.3 percent of the adult population in 2017, equivalent to 352.1 million individuals. By 2045, the prevalence is anticipated to increase to 8.3 percent of the global adult population, equivalent to an estimated 587 million individuals. In 2020, the U.S. Center for Disease Control and Prevention reported that 96 million people aged 18 or over have prediabetes, representing 38 percent of the U.S. adult population.

Testing for prediabetes and diabetes

Testing for prediabetes involves finding out your blood glucose level (the level of sugar in your blood). Prediabetes exists when the body's blood glucose level is higher than normal but not high enough to meet the standard definition of diabetes. (which we discuss in the section "Diagnosing diabetes through testing," later in this chapter). Testing measures a random blood glucose. If the level is greater than 100 milligrams per deciliter (mg/dl), a fasting glucose (glucose measured when a person has had no food for eight hours) or oral glucose tolerance test is performed. The oral glucose tolerance test measures the rise in blood sugar over time following the consumption of a specific amount of sugar. In diabetes, the sugar level increase is higher and more prolonged. As of 2023, the American Diabetes Association recommends that the hemoglobin A1C (see the next section) can also be used for the definition, and this is in line with World Health Organization

criteria. Table 2-1 shows the hemoglobin A1C and glucose levels that indicate prediabetes:

- If the fasting glucose (the glucose before the test) is between 100 and 125 mg/dl, the person has impaired (abnormally high) fasting glucose (see Table 2-1). In other words, the glucose in the fasting state isn't normal, but it's not high enough to diagnose diabetes.
- If the glucose is between 140 and 199 mg/dl at two hours after eating 75 grams of glucose, the person has impaired glucose tolerance. Both impaired fasting glucose and impaired glucose tolerance may be present.
- A hemoglobin A1C between 5.7 and 6.4 percent (42 to 48 mmol/l) suggests prediabetes.

TABLE 2-1 Diagnosing Prediabetes

Condition	Glucose Before Eating	Glucose Two Hours After Eating 75g Glucose	Hemoglobin A1C
Normal	Less than 100 mg/dl (5.5 mmol/L)	Less than 140 mg/dl (7.8 mmol/L)	Less than 5.7 percent
Prediabetes	100–125 mg/dl (5.5–7 mmol/L)	140–199 mg/dl (7.8–11 mmol/L)	5.7–6.4 percent

TIP

Receiving a prediabetes diagnosis may motivate a person to make crucial lifestyle changes, especially in diet and exercise, which have been shown to prevent the onset of diabetes in people with prediabetes. Using the strategies described in this book and seeing improvements in HBA1C can quite literally change and save lives.

Detecting Diabetes

When prediabetes becomes diabetes, the body's blood glucose level registers even higher. In this section, we discuss the symptoms you may experience with diabetes and evidence for a diabetes diagnosis.

Recognizing the symptoms of diabetes

The following list contains the most common early symptoms of diabetes and how they occur. One or more of the following symptoms may be present when diabetes is diagnosed, though it's important to remember that diabetes can exist

undetected for some time before symptoms are noticed and is increasingly coming to light following screening (read more about the criteria for diagnosis in the "Diagnosing diabetes through testing" section):

- **Frequent urination and thirst:** The glucose in the urine draws more water out of your blood, so more urine forms, making you feel the need to urinate more frequently. As the amount of water in your blood declines, you feel thirsty and drink much more frequently.
- **Blurry vision:** As the glucose level shifts from normal to very high, the lens of the eye swells due to water intake. This swelling prevents the eye from focusing light at the correct place, and blurring occurs.
- **Extreme hunger:** Inability to get energy in the form of glucose into the muscle cells that need it leads to a feeling of hunger despite all the glucose that is floating in the bloodstream. Such hunger is called "starvation in the midst of plenty."
- **Fatigue:** Without sufficient insulin, or with ineffective insulin, glucose can't enter cells (such as muscle and fat cells) that depend on insulin to act as a key. (The most important exception here is the brain, which doesn't need insulin to extract glucose from the blood.) As a result, glucose can't be used as a fuel to move muscles or to facilitate the many other chemical reactions that have to take place to produce energy. A person with diabetes often complains of fatigue and feels much stronger after treatment allows glucose to enter their cells again.
- **Mood swings:** Fluctuations in blood sugar levels can cause irritability and uncontrollable emotions in a way that is similar to someone who has had too much to drink.
- **Sleepiness after a meal:** One of the most underrecognized signs of diabetes is an extreme fatigue that can't be shaken after a meal. It's normal to feel a bit relaxed when you're satisfied from a meal, but if you feel as if you can't resist the urge to fall asleep after eating, it may be from the body's resistance to insulin.
- **Weight loss:** Weight loss occurs among some people with diabetes because they lack insulin, the builder hormone. When the body lacks insulin for any reason, the body begins to break down. You lose muscle tissue. Some of the muscle converts into glucose, even though the glucose can't get into cells. It passes out of your body in the urine. Fat tissue breaks down into small fat particles that can provide an alternative source of energy. As your body breaks down and you lose glucose in the urine, you often experience weight loss. However, most people with diabetes are heavy rather than skinny (we explain why in Chapter 3).

SIMILAR SYMPTOMS, DIFFERENT DISEASES: DIABETES INSIPIDUS

Frequent thirst and urination are the most commonly recognized symptoms of diabetes, but diabetes mellitus isn't the only condition that causes these symptoms. Another condition in which fluids go in and out of the body like a siphon is called *diabetes insipidus*. With this condition, the urine isn't sweet. Diabetes insipidus is an entirely different disease that you shouldn't mistake for diabetes mellitus.

Diabetes insipidus results when a hormone in the brain called antidiuretic hormone is missing or when the kidneys can't properly respond to antidiuretic hormone. This hormone normally helps the kidneys prevent the loss of a lot of the water in the body. Other than the name *diabetes*, this condition has nothing to do with diabetes mellitus.

- **Persistent vaginal or penile infections:** As blood glucose rises, all the fluids in your body contain higher levels of glucose, including sweat and body secretions such as semen in men and vaginal secretions in women. Many bugs, such as bacteria and yeast, thrive in the high-glucose environment. Women may begin to complain of itching or burning, an abnormal discharge from the vagina, and sometimes an odor. Men may have soreness and itching of the penis.

WARNING

A study in the November 2007 issue of *Diabetes Care* showed that in a group of more than 15,000 people being treated for diabetes, 44 percent of people with type 2 diabetes reported not one of the preceding symptoms in the previous year when given a questionnaire. It's no wonder that a third of people with diabetes don't know they have it.

Diagnosing diabetes through testing

The standard definition of diabetes mellitus is excessive glucose in a blood sample. For years, doctors set this level fairly high. The standard level for normal glucose was lowered in 1997 because too many people were experiencing complications of diabetes even though they did not have the disease by the then-current standard. In November 2003, the standard level was modified again. In 2009, the International Expert Committee on Diagnosis and Classification of Diabetes Mellitus recommended using the hemoglobin A1C as a diagnostic criterion for diabetes, and the American Diabetes Association subsequently accepted the recommendation.

After much discussion, many meetings, and the usual deliberations that surround a momentous decision, the American Diabetes Association published the new standard for diagnosis, which includes any *one* of the following four criteria:

- Hemoglobin A1C equal to or greater than 6.5 percent or 48 mmol/L.
- Casual, or random, plasma glucose concentration greater than or equal to 200 mg/dl, along with symptoms of diabetes. *Casual plasma glucose* refers to the glucose level when the patient eats normally prior to the test.
- Fasting plasma glucose (FPG) of greater than or equal to 126 mg/dl or 7 mmol/L. *Fasting* means that the patient has consumed no food or drink other than water for eight hours prior to the test.
- Blood glucose of greater than or equal to 200 mg/dl (11.1 mmol/L) when tested two hours (2-h PG) after ingesting 75 grams of glucose by mouth. This test has long been known as the *oral glucose tolerance test*. Although this time-consuming, cumbersome test is rarely done, it remains a very accurate test for the diagnosis of diabetes.

REMEMBER

Testing positive for diabetes one time isn't enough to confirm a diagnosis. Any one of the tests must be positive on another occasion to make a diagnosis of diabetes. In some cases, people receive a diagnosis of diabetes after being tested only once, but a second test shows the initial diagnosis to be incorrect.

TRACKING DIABETES AROUND THE WORLD

Diabetes is a global health problem. Type 2 diabetes is especially prevalent where obesity is common. In 2021, the World Health Organization reported that obesity had nearly tripled since 1975, with more than 1.9 billion adults — that's 39 percent of the population — being classified as overweight or obese by 2016, and the majority of the world's people now live in countries where being overweight or obese kills more people than being underweight. Perhaps even more concerning is the rapid rise in childhood obesity, with 340 million children and adolescents being overweight or obese.

With the rise in levels of obesity, there has followed a rise in the commonest form of diabetes — type 2 diabetes. An estimated 422 million adults — 8.5 percent of the world's adult population — were living with diabetes in 2014, compared to 108 million in 1980. By 2019, diabetes was the direct cause of 1.5 million deaths worldwide. During the last decade, rates of diabetes have risen in low- and middle-income countries faster than in high-income countries, probably as people move away from traditional lifestyles and adopt a more "Western"-style diet with processed foods and added sugars.

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One very interesting study traced people of Japanese ancestry as they went from living in Japan to living in Hawaii to living in the United States mainland. In Japan, where people customarily maintain a normal weight, they tended to have a very low incidence of diabetes. As they moved to Hawaii, the incidence of diabetes began to rise along with their average weight. On the U.S. mainland, those studied had the highest rate of diabetes of all.

Explaining the Obesity (and Diabetes) Epidemic

Many changes explain the epidemic of obesity and diabetes that began to explode in the 1950s and '60s. Here are some of them:

- The availability of fast-food restaurants and vending machines
- The frequency of television commercials for foods filled with added fats and sugar
- The large number of screens watched passively all day, from TVs to smartphones
- The larger, higher-calorie meals that tend to be eaten, both at home and at restaurants
- The dependence on vehicles for much movement leading to a much more sedentary lifestyle
- The huge increase in mass-produced high-calorie convenience foods, which are processed or ultra-processed with added sugars, increase incidence of all sorts of diseases which goes up the more you eat. These foods have fewer nutrients and are pro-inflammatory. Chapter 8 discusses the best diets for those with diabetes.
- Marketing propaganda by prepared food companies, which encourages consumers to consume their products as a "smart solution" for lack of time, money, and so on.
- The evolution of plate sizes that has resulted in modern American dinner plates being the same size as platters were decades earlier.

What steps can people take to reverse this trend? Some of the ideas developed to reverse the high rate of cigarette smoking can be recycled, but the process takes years for the whole population. What you can do immediately is contained in Part 3. Some of the population-wide measures include the following strategies:

- Promoting a culture that values whole foods, cooking, and nutrition.
- Creating awareness of how ultra-processed foods lead to disease.
- Adding a tax on low-nutrition foods like sweetened beverages and on those processed foods with unnecessary addition of sugars.
- Establishing better labeling of foods to make clearer to consumers the amount of added sugars, including ingredients such as high fructose corn syrup — for example, a red label for low-nutrition, high-calorie foods; a yellow label for intermediate foods; and a green label for low-calorie, high-nutrition foods.
- Placing a ban on or reduction of advertising of junk foods.
- Starting school-based programs promoting healthier eating and elimination of soft drinks and sugared juices.
- Encouraging limits to the amount of screen time for children and programs to increase exercise.
- Investing in initiatives for greater nutritional education to promote *food literacy* — the understanding of the importance of diet, the enjoyment of healthy foods, skills in food preparation and cooking, and the celebration of shared meals in company.
- Encouraging smaller, appropriate portion sizes. Portion sizes in restaurants are large so they can charge a decent amount of money for their items and make a profit. This has caused our modern society to be out of touch with what an actual portion size is. We should focus and insist on quality over quantity as well as educate consumers on nutrition.

IN THIS CHAPTER

- Paying attention to your pancreas
- Comparing type 1 and type 2 diabetes
- Introducing other types of diabetes

Chapter 3

Recognizing the Various Types of Diabetes

It's amazing to think of the impact that a tiny organ like the pancreas can play in your health. Most people aren't as familiar with the pancreas as they are with other large organs, such as the heart, liver, and lungs. Most of the time, your pancreas hides behind your stomach, quietly doing its work by assisting with digestion first and then helping make use of the digested food. The pancreas plays a role in all the various types of diabetes, not least because of its central role in producing insulin. In this chapter, we explain how the pancreas operates.

We shared a little about insulin in the previous chapter, and we share a lot more about it here, because a lack of insulin, or resistance to its work to regulate blood sugar levels, is fundamental to diabetes.

There are distinctions to be made between different types of diabetes, their contrasting causes and the role of the pancreas in each, as well as the levels of insulin production and its effectiveness in controlling blood sugar levels. The ways in which type 1 and type 2 diabetes present are quite different, as are some of the risks and complications. This extends to your ability to prevent or reverse the development of diabetes. Type 2 diabetes — the most common form, is the main focus of this book and is most susceptible to influence by lifestyle changes, although excellent nutrition and beneficial exercise as well as optimum blood sugar control are key to preventing the complications of any type of diabetes.

Getting to Know Your Pancreas and Its Role in Diabetes

You don't think about your pancreas very often, but it's always doing its work. It has two major functions. One is to produce *digestive enzymes,* which are the chemicals in your small intestine that help break down food. The digestive enzymes don't have much relation to diabetes. Your pancreas's other function is to produce a hormone of major importance, insulin, and to secrete it directly into the blood. The following sections explore the ins and outs of your pancreas and insulin so that you're well acquainted with both.

Examining your pancreas

Figure 3-1 shows the microscopic appearance of the pancreas. The following list explains the different cells found in the pancreas as well as their functions:

- **B cells:** The insulin-producing pancreas cells (also called beta cells) are found in groups called Islets of Langerhans.
- **A cells:** These cells produce *glucagon,* a hormone that's very important to people with diabetes because it raises blood glucose when the glucose level gets too low. A cells are present in the Islets of Langerhans.
- **D cells:** These cells make *somatostatin* (a hormone that blocks the secretion of other hormones but doesn't have a use in diabetes because it causes high blood sugar and increased ketones by blocking insulin as well). Please see Chapter 4 for more information on high blood sugar and ketones. Cells are also found in the Islets of Langerhans.

Understanding insulin

REMEMBER

If you understand only one hormone in your body, insulin should be that hormone (especially if you want to understand diabetes). Over the course of your life, the insulin that your body produces or the insulin that you inject into your body (as we describe in Chapter 11) affects whether you control the glucose levels in your blood and avoid the complications of the disease.

Think of your insulin as an insurance agent who lives in San Francisco (which is your pancreas) but travels from there to do business in Seattle (your muscles), Denver (your fat tissue), Los Angeles (your liver), and other places. This insulin insurance agent is insuring your good health.

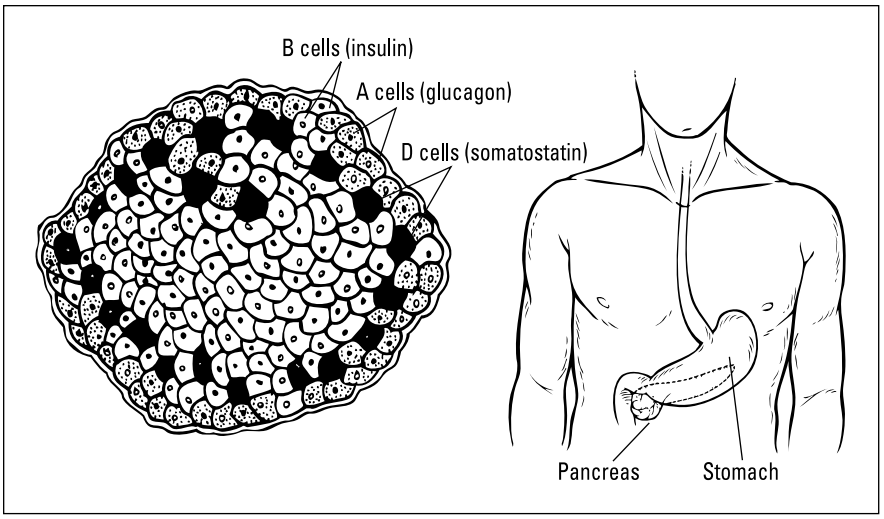

FIGURE 3-1: The pancreas and its parts.

Illustration by Kathryn Born

Wherever insulin travels in your body, it opens up the cells so that glucose can enter them. After glucose enters, the cells can immediately use it for energy, store it in a storage form of glucose (called *glycogen*) for rapid use later on, or convert it to fat for use even later as energy.

After glucose leaves your blood and enters your cells, your blood glucose level falls. Your pancreas can tell when your glucose is falling, and it turns off the release of insulin to prevent *hypoglycemia,* an unhealthy low level of blood glucose (see Chapter 4). At the same time, your liver begins to release glucose from storage and makes new glucose from amino acids in your blood.

If your insurance agent (insulin, remember? — stick with us here!) doesn't show up when needed (meaning that you have an absence of insulin, as in type 1 diabetes) or does a poor job when they show up (such as when you have a resistance to insulin, as in type 2 diabetes), your insurance coverage may be very poor (in which case your blood glucose starts to climb). We discuss insulin resistance later in the chapter. High blood glucose is the beginning of all your problems.

Doctors have proven that high blood glucose is bad for you and that keeping the blood glucose as normal as possible prevents the complications of diabetes (which we explain in Part 2). Most treatments for diabetes are directed at restoring the blood glucose to normal.

Understanding Type 1 Diabetes and You

John Phillips, a 6-year-old boy, was always very active, and his parents became concerned when the counselors at summer camp told them that he seemed not to have much energy. When he got home from camp, John's parents noticed that he was thirsty all the time and running to the bathroom. He was very hungry but seemed to be losing weight, despite eating more than enough. John's parents took him to the pediatrician, who did several blood glucose tests and diagnosed him with *type 1 diabetes mellitus* (T1DM), which formerly was called *juvenile diabetes* or *insulin-dependent diabetes*.

John's parents were willing to do the necessary things to bring John's glucose under control. John is just as energetic as ever, but he has had to get used to a few inconveniences in his daily routine. The following sections touch on the symptoms and causes of this type of diabetes.

Identifying symptoms of type 1 diabetes

Following are some of the major signs and symptoms of type 1 diabetes. If you find you have any of these symptoms and haven't already been diagnosed with diabetes, call your doctor:

- Frequent urination
- Increase in thirst
- Weight loss
- Increase in hunger
- Weakness

Type 1 diabetes used to be called juvenile diabetes because it is most often diagnosed in childhood. However, so many cases are found in adults that doctors don't use the term *juvenile* anymore. Some children are diagnosed early in life, and other children have a more severe onset of the disease as they get a little older.

With both children over age 10 and adults, the early signs and symptoms of diabetes may have been missed. These people have a great deal of fat breakdown in their bodies to provide energy, and this fat breakdown creates other problems. *Ketone bodies*, products of the breakdown of fats, begin to accumulate in the blood and spill into the urine. Ketone bodies are acidic and lead to nausea, abdominal pain, and sometimes vomiting.

WARNING

At the same time as fat is breaking down, the child's blood glucose rises higher. From a normal level of 80 mg/dl (4.4 mmol/L), blood glucose can rise to the unhealthy level of 300 mg/dl (16 mmol/L) and even up to the dangerously high levels of 400 to 600 mg/dl (22.2 to 33.3 mmol/L). At high levels, the child's blood is like thick maple syrup and doesn't circulate as freely as normal. The large amount of water leaving the body with the glucose depletes important substances such as sodium and potassium. Vomiting causes the child to lose more fluids. All these abnormalities cause the child to become very drowsy and possibly lose consciousness. This situation is called *diabetic ketoacidosis*, and if it isn't identified and corrected quickly, the child can die. (See Chapter 4 for more details on the symptoms, causes, and treatments of ketoacidosis.)

A few special circumstances affect the symptoms that you may see in persons with type 1 diabetes. Remember the following factors:

- The *honeymoon period,* a natural occurrence, is a time after the diagnosis of diabetes when the person's insulin needs decline for one to six months and the disease seems to get milder. The honeymoon period is longer when a child is older at the time of diagnosis, but the apparent diminishing of the disease is always temporary.
- Males and females get type 1 diabetes to an equal degree.
- Warm summer months are associated with a decrease in the occurrence of diabetes compared to the winter months, particularly in children older than 10. The probable reason for this phenomenon is that a virus may be involved in bringing on diabetes (which we discuss in "Getting type 1 diabetes"), and viruses are often more prevalent in the winter.

Investigating the causes of type 1 diabetes

When your doctor diagnoses you with type 1 diabetes, you'll almost certainly wonder what caused the disease. Did someone with diabetes sneeze on you? Did you eat so much sugary food that your body reacted by giving you diabetes? Rest assured that the causes of diabetes aren't so simple.

Type 1 diabetes is an *autoimmune disease*, meaning that your body is unkind enough to react against — and in this case, destroy — a vital part of itself, namely the insulin-producing beta (B) cells of the pancreas. One way that doctors discovered that type 1 diabetes is an autoimmune disease is by measuring proteins in the blood, called antibodies, which are usually produced to destroy invading bacteria or viruses but in this case are mistakenly directed against your body — in particular, against your islet cells. Another clue that type 1 diabetes is an autoimmune disease is that drugs that reduce autoimmunity also delay the onset of

type 1 diabetes. Also, type 1 diabetes tends to occur in people who have other known autoimmune diseases.

You may wonder how doctors can know in advance that certain people will develop type 1 diabetes. The method of prediction isn't 100 percent accurate, but people who get type 1 diabetes more often have certain abnormal characteristics on their genetic material, their *chromosomes,* that aren't present in people who don't get type 1 diabetes. Doctors can look for these abnormal characteristics on your DNA, but having these abnormal characteristics doesn't guarantee that you'll get diabetes.

Another essential factor in predicting whether you'll develop type 1 diabetes is your exposure to something in the environment, most likely a virus. We discuss this factor in detail in the next section.

Getting type 1 diabetes

To develop diabetes, most people also have to come in contact with something in the environment that triggers the destruction of their beta cells, which make insulin. Doctors think that this environmental trigger is possibly a virus. A particular virus may cause diabetes by attacking your pancreas directly and diminishing your ability to produce insulin, which quickly creates the diabetic condition in your body. Alternatively, the virus may look similar to parts of insulin-producing cells in the pancreas, resulting in the immune system mistakenly attacking the cells. It may expose insulin-producing cells to the immune system in an unusual way, leading to an attack, or even change how insulin-producing cells behave, making them appear as a threat to the immune system.

A small number (about 10 percent) of patients who develop type 1 diabetes don't seem to need an environmental factor to trigger the diabetes. In these people, the disease is entirely an autoimmune destruction of the beta cells. If you fall into this category of people with diabetes, you may have other autoimmune diseases, such as autoimmune thyroid disease or Celiac Disease.

Also, some new research shows that the naturally occurring bacteria in the gut — microbiome — may have a role to play in the development of type 1 diabetes, but more research is needed in this field.

Although genetics plays a role in developing type 1 diabetes, the connection is relatively minor. An identical twin has only a 20 percent chance of developing type 1 diabetes if the other twin (who has the exact same genetic material) has it.

Preventing complications of type 1 diabetes

Because the cause of type 1 diabetes isn't well understood, there's currently no clinically proven way to prevent or reverse the condition. However, it's certainly possible to decrease the risk of potentially harmful complications.

The most important study of prevention of diabetes complications ever done for type 1 diabetes is called the Diabetes Control and Complications Trial (DCCT), published in 1993. Since then, similar results have been shown in numerous other studies. The DCCT showed that keeping very tight control over your blood glucose is possible but difficult, though treatments have certainly advanced since then to make it easier. The difficult part of keeping your blood glucose close to normal is that you increase your risk of having low blood glucose, or *hypoglycemia* (see Chapter 4). The DCCT study showed that you can prevent many of the complications of diabetes — including eye, kidney, and nerve disease — by keeping your blood glucose as close to normal as possible. If you already suffer from such complications, improving your blood glucose control very significantly slows the progression of the complications.

Having Type 2 Diabetes

Edythe Fokel, a 46-year-old woman, has gained about 10 pounds in the last year so that her 5-foot 5-inch body now weighs about 155 pounds. Edythe doesn't do much exercise. She has felt somewhat fatigued recently, but she blames her age and approaching menopause. She also blames the fact that she now gets up several times a night to urinate, which she didn't used to do. She is disturbed because her vision is blurry and her job requires working on a computer. Finally, Edythe goes to her gynecologist after developing a rash and discharge in her vagina. When Edythe describes her symptoms, her gynecologist decides to do a blood glucose test. He refers her back to her primary physician when Edythe's blood glucose level registers at 220 mg/dl (12.2 mmol/L).

Edythe's primary doctor asks her whether other members of her family have had diabetes, and she replies that her mother and a sister are both being treated for it. The doctor also asks Edythe about any tingling in her feet, and she admits that she has noticed some tingling for the past few months but didn't think it was important. The primary doctor repeats the random blood glucose test, which comes back at 260 mg/dl (14.4 mmol/L). He informs Edythe that she has type 2 diabetes (T2DM).

The signs and symptoms that Edythe manifests in this scenario, along with the results of the two blood glucose tests, provide a textbook picture of type

2 diabetes. (Type 2 diabetes used to be known as *adult-onset diabetes* or *non-insulin-dependent diabetes*.) Be aware that people with type 2 diabetes may have few or none of these symptoms. Because of the varying symptoms, your doctor may advise to check your blood glucose level on a regular basis. (We discuss how often you should do this test in Chapter 7.)

Most people with type 2 diabetes are over the age of 40, but more and more cases are being diagnosed in children and young adults. Your chances of getting type 2 diabetes increase as you get older. Type 2 diabetes is a disease of gradual onset rather than the severe emergency that can herald type 1 diabetes. Because the symptoms are so mild at first, you may not notice them. You may ignore these symptoms for years before they become bothersome enough to consult your doctor. Doctors believe that no virus is involved in the onset of type 2 diabetes.

Recent statistics show that ten times more people worldwide have type 2 diabetes than type 1 diabetes. A 2018 study found that 8.5 percent of American adults had been diagnosed with type 2 diabetes compared with only 0.5 percent with type 1 diabetes. Among those who were diagnosed with diabetes, 91.2 percent had type 2 diabetes and 5.6 percent had type 1 diabetes.

Although type 2 is much more prevalent, those with type 2 diabetes seem in general to have milder complications (such as eye disease and kidney disease) from diabetes. (See Part 2 for details about the possible complications of diabetes. See Part 3 for treatments that can help you prevent these complications.)

Identifying symptoms of type 2 diabetes

A concerning large percentage of the population in most countries in the world has type 2 diabetes (T2DM). The numbers are on the rise, and one reason is an increase in the incidence of obesity, a major risk factor for T2DM. If you're obese, you're considerably more likely to acquire T2DM than if you maintain your ideal weight. (See Chapter 7 for the details on how to figure out your weight classification.)

ASK THE DOCTOR

The following signs and symptoms are good indicators that you have type 2 diabetes. If you experience two or more of these symptoms and haven't already been diagnosed with diabetes, call your doctor:

- **Fatigue:** Type 2 diabetes makes you tired because your body's cells aren't getting the glucose fuel that they need. Even though your blood has plenty of insulin, your body is resistant to its actions. (See the "Getting to Know Your Pancreas and Its Role in Diabetes" section for more explanation.)

- **Frequent urination and thirst:** As with type 1 diabetes, you find yourself urinating more frequently than usual, which dehydrates your body and leaves you thirsty.
- **Blurred vision:** The lenses of your eyes swell and shrink as your blood glucose levels rise and fall. Your vision blurs because your eyes can't adjust quickly enough to these lens changes.
- **Slow healing of skin, gum, and urinary infections:** Your white blood cells, which help with healing and defend your body against infections, don't function correctly in the high-glucose environment present in your body when it has diabetes. Unfortunately, the bugs that cause infections thrive in the same high-glucose environment, so diabetes leaves your body especially susceptible to infections.
- **Genital itching:** Yeast infections also love a high-glucose environment, so diabetes is often accompanied by the itching and discomfort of yeast infections.
- **Numbness in the feet or legs:** You experience numbness because of a common long-term complication of diabetes called neuropathy. (We explain the details of *neuropathy* in Chapter 5.) If you notice numbness and neuropathy along with the other symptoms of diabetes, you probably have had the disease for quite a while, because neuropathy takes more than five years to develop in a diabetic environment. Occasionally numbness occurs earlier when extreme elevations of the glucose happen.
- **Heart disease, stroke, and peripheral vascular disease:** Heart disease, stroke, and peripheral vascular disease (blockage of arteries in the legs) occur much more often in people with type 2 diabetes, but these complications may appear when you're merely glucose-intolerant (which we explain in the next section), before you actually have diagnosable diabetes.

The signs and symptoms of type 2 diabetes are similar in some cases to the symptoms of type 1 diabetes (which we cover in the "Identifying symptoms of type 1 diabetes" section, earlier in this chapter), but in many ways, they're different. The following list shows some of the differences between symptoms in type 1 and type 2 diabetes:

- **Age of onset:** People with type 1 diabetes are usually younger than those with type 2 diabetes. However, the increasing incidence of type 2 diabetes in overweight children is making this difference less useful for separating type 1 and type 2 diabetes.
- **Body weight:** Those with type 1 diabetes are usually thin or normal in weight, but obesity is a common characteristic of people with type 2 diabetes.

- **Level of glucose:** People with type 1 diabetes have higher glucose levels at the onset of the disease. Type 1 diabetics usually have blood glucose levels of 300 to 400 mg/dl (16.6 to 22.2 mmol/L), and people with type 2 diabetes usually have blood glucose levels of 200 to 250 mg/dl (11.1 to mmol/L).
- **Severity of onset:** Type 1 diabetes usually has a much more severe onset, but type 2 diabetes gradually shows its symptoms.

Investigating insulin sensitivity and resistance

If you've been diagnosed with type 2 diabetes (T2DM), you're probably shocked and curious about why you developed the disease. Doctors have learned quite a bit about the causes of T2DM. For example, they know that it can run in families.

REMEMBER

Usually, people with T2DM can find a relative who has had the disease. Therefore, doctors consider T2DM to have much more of a genetic component than T1DM. In studies of identical twins, when one twin has T2DM, the likelihood that the condition will develop in the other twin is nearly 100 percent. However, we now know that it's possible to prevent or even reverse conditions despite a genetic predisposition. You may not be able to change your genes, but you can certainly influence your tendency to develop some gene-related diseases. The way in which genes express themselves can be affected by many factors over which you have some control, such as diet and lifestyle, which we discuss further in Chapter 9.

Insulin resistance

People with type 2 diabetes have plenty of insulin in their bodies (unlike people with type 1 diabetes), but their bodies respond to the insulin in abnormal ways. Type 2 diabetics are *insulin-resistant,* meaning that their bodies resist the normal, healthy functioning of insulin. This resistance, combined with not having enough insulin to overcome the insulin resistance, causes the disease.

Most people who develop type 2 diabetes are born with the genes for insulin resistance. Before diabetes is present, future T2DM patients already show signs of insulin resistance. First, the amount of insulin in their blood is elevated compared to normal people. Second, a shot of insulin doesn't reduce the blood glucose in these insulin-resistant people nearly as much as it does in people without insulin resistance. (See Chapter 11 to find out more about insulin shots in diabetes.)

When your body needs to make extra insulin just to keep your blood glucose normal, your insulin is, obviously, less effective than it should be — which means that you have insulin resistance. If your insulin resistance worsens to the point

that your body can't produce enough insulin to keep your blood glucose normal, or if your pancreas starts to get "tired" of making so much extra insulin, your blood sugars become abnormal. This condition is prediabetes, because your blood glucose is still lower than the levels needed for a diagnosis of diabetes (see Chapter 2). When you add other factors such as weight gain, a sedentary lifestyle, certain medications, and aging, your pancreas can't keep up with your insulin demands, and you develop prediabetes, followed by diabetes. There is some evidence that suggests that insulin resistance can be, in some circumstances, associated with chromium and magnesium or vitamin D levels. It is important to check the levels of these substances in your blood work with your physician.

REMEMBER

Insulin resistance isn't a one-way street. We now know that genes, diet, a healthy gut microbiome, exercise, and even better-quality sleep can work the other way and support insulin to work more efficiently, decreasing insulin resistance. This is described as increasing insulin *sensitivity.* So, the good news is that you can counter even genetic predisposition to insulin resistance through lifestyle changes (explored in other chapters in this book).

TECHNICAL STUFF

Another factor that comes into play when doctors make a diagnosis of T2DM is the release of sugar from the glycogen stored in your liver, known as your *hepatic glucose output.* People with T2DM have high glucose levels in the morning after having fasted all night. You'd think that your glucose would be low in the morning if you haven't eaten any sugar, but your liver is a storage bank for a lot of glucose, and it can make even more from other substances in the body. As your insulin resistance increases, your liver begins to release glucose inappropriately, and your fasting blood glucose level rises.

Common misunderstandings about type 2 diabetes

People often think that the following factors cause type 2 diabetes, but they actually have nothing to do with the onset of the disease:

- **Antibodies:** Antibodies against islet cells aren't a major factor in type 2 diabetes (see the section "Investigating the causes of type 1 diabetes," earlier in this chapter). Type 2 diabetes isn't usually an autoimmune disease like type 1.
- **Gender:** Males and females are equally as likely to develop type 2 diabetes. Gender doesn't play a role in the onset of this disease.
- **Diabetic ketoacidosis:** Type 2 diabetes isn't generally associated with diabetic ketoacidosis (see Chapter 4). People with type 2 diabetes are ketosis resistant, except under extremely severe stress caused by infections or trauma. (See Chapter 4 for a discussion of *hyperosmolar syndrome,* a related

condition in which people with type 2 diabetes have extremely high glucose but don't have the fat breakdown that leads to ketoacidosis.)

- **Type 2 diabetes is "non-insulin-dependent":** Type 2 diabetes has been called "non-insulin-dependent diabetes." This is a misnomer because although it's reserved for the most severe cases, insulin can sometimes be a treatment for type 2 diabetes. Its use doesn't change the type of diabetes from 1 to 2.

Getting type 2 diabetes

Genetic inheritance is necessary in type 2 diabetes, but environmental factors such as obesity, lack of exercise, and poor diet trigger the disease. People with type 2 diabetes are relatively insulin-resistant before they become obese or sedentary. Aging, poor eating habits, obesity, and failure to exercise combine to worsen insulin resistance and bring out the disease.

Inheritance seems to be a much stronger factor in type 2 diabetes than in type 1 diabetes. Consider the following statistics that have commonly been quoted and from which there is much to learn:

- If your father has type 2 diabetes but your mother doesn't, you have about a 4 percent chance of getting the disease.
- If your mother has type 2 diabetes but your father doesn't, your chances of getting it leap to about 10 percent.
- If your identical twin has type 2 diabetes, you have a nearly 100 percent chance of eventually getting the disease.
- If your sibling (*not* an identical twin) gets type 2 diabetes, you have about a 40 percent chance of doing the same.

Although these numbers may seem frightening at first, developing diabetes isn't inevitable if you have a family history and possible genetic predisposition. The good news is that we now know the positive modifiable lifestyle factors that can decrease insulin resistance and increase insulin sensitivity and delay, prevent, and even reverse the onset of type 2 diabetes. With the support of the advice in this book, you can buck these historical trends.

TIP

Here's an interesting fact: Spouses of people with type 2 diabetes are at higher risk of developing diabetes and should be screened just like relatives of people with diabetes. Why? Because they share the environmental risk factors for diabetes, such as poor diet and a sedentary lifestyle.

Preventing the causes of type 2 diabetes

Doctors can predict type 2 diabetes years in advance of its actual diagnosis by studying the close relatives of people who have the condition. This early-warning period offers plenty of time to try techniques of primary prevention. After a doctor discovers that someone's blood glucose levels are high and diagnoses type 2 diabetes, complications such as eye disease and kidney disease (see Chapter 5) usually take ten or more years to develop in that person. During this time, doctors can apply secondary prevention techniques (the various treatments we discuss in Part 3).

Because so many people suffer from type 2 diabetes, doctors have had a wealth of people to study to determine the most important environmental factors that turn a genetic predisposition to type 2 diabetes into a clinical disease. The following sections cover the major environmental factors.

High body-mass index (BMI)

The *body-mass index* (BMI) is the way that doctors look at weight in relation to height. BMI is a better indicator of a healthy weight than just weight alone because taller people tend to weigh more. For instance, a person who weighs 150 pounds and is 62 inches tall is overweight, but a person who weighs 150 pounds and is 70 inches tall is thin.

TIP

You can easily determine your BMI by using the following formula: Multiply your weight (in pounds) by 703, and then divide that number by your height (in inches). Divide that result by your height (in inches) again. If you use the metric system, divide your weight in kilograms by your height in meters and divide that result by your height in meters again. Using this formula, the 150-pound person with a height of 62 inches has a BMI of 27.5, whereas the person with the height of 70 inches has a BMI of 21.6.

Current guidelines state that a person with a BMI from 25 to 29.9 is overweight, and a person with a BMI of 30 or greater is obese. A BMI between 18.5 and 25 is considered normal. A person with a BMI of 40 or higher has morbid obesity.

Many studies have verified the great importance of the BMI level in predicting who gets diabetes. For example, a large study of thousands of nurses in the United States showed that nurses with a BMI greater than 35 had diabetes almost 100 times more often than nurses with a BMI less than 22. Even among the women in this study considered to be lean, those with the higher BMI, though still in the category of normal, had three times the prevalence of diabetes compared to those with lower BMI. Another large study of U.S. physicians found the same relationship of high BMI to high levels of type 2 diabetes. The same study showed that the length of time that you're obese is important; participants who were obese for ten years were more likely to have diabetes than those who had become obese more recently.

REMEMBER

BMI is certainly not a perfect measurement when it comes to defining the amount of unnecessary body fat contributing to weight. Though it's simple and therefore can be a useful guide, what may be considered a normal range can vary among ethnic groups. BMI also doesn't take into account muscle mass or bone density, both of which contribute positively to health in older populations especially. Measuring abdominal girth using a tape measure or assessing skinfold fat using calipers are other useful techniques to assess risk of developing type 2 diabetes, but these are very dependent on technique. More sophisticated laboratory methods such as hydrostatic (underwater weighing) or measuring air displacement in a "body pod" aren't practical other than in research.

Physical inactivity

Physical inactivity has a high association with diabetes, as evidenced in many studies. Former athletes have diabetes less often than nonathletes. The same study of nurses' health that we cited in the preceding section showed that women who were physically active on a regular basis had diabetes only two-thirds as often as those who were less active. A study conducted in Hawaii, which didn't include any obese people, showed that the occurrence of diabetes was greatest for people who don't exercise.

Central distribution of fat

When people with diabetes become fat, they tend to carry the extra weight as centrally distributed fat, also known as *visceral fat*. You check your visceral fat when you measure your waistline, because this type of fat stays around your midsection. So a person with visceral fat is more apple-shaped than pear-shaped. Visceral fat also happens to be the type of fat that probably comes and goes most easily on your body, and it's relatively easy to lose when you diet. Visceral fat seems to cause more insulin resistance than fat in other areas and is also correlated with the occurrence of coronary artery disease. If you have a lot of visceral fat, losing just 5 to 10 percent of your weight may dramatically reduce your chance of diabetes or a heart attack.

WARNING

Even when the BMI (see earlier section) is within the normal range (less than 25), people with a greater waist circumference have an increased mortality. If you're 40 or younger and your waistline measures 39.5 inches (100 centimeters) or greater, or you're between the ages of 40 and 60 and your waistline measures 35.5 inches (90 centimeters) or more, you have a significantly increased risk of a heart attack. Try to shrink your waistline as well as your weight.

Poor-quality diet

Populations with a high prevalence of diabetes tend to eat a diet that has contributed to a high BMI and greater central distribution of fat, which are both factors

that increase the likelihood of developing diabetes. We look into this in much greater detail throughout the book, providing you with the positive nutritional tools to support weight management as well as manage blood sugar control to support the possibility of preventing, reversing, or controlling type 2 diabetes more effectively.

REMEMBER

If you recognize any of the preceding factors in your body or lifestyle, you can correct them in time to prevent diabetes. Type 2 diabetes allows the high-risk individual or the diagnosed person the time to work toward prevention or control of the disease. In Part 3, we show you specific ways to reduce your weight, increase your exercise, improve your diet, and prevent or reverse diabetes and diabetic complications.

Recognizing Variants of Types 1 and 2 Diabetes

Certain groups of patients with diabetes don't follow the classic description of type 1 or 2. They make up a sizable portion of type 2 patients and require individualized treatment (and you could be among them), so we briefly explain their characteristics in this section.

LADA

As many as 10 percent of people diagnosed with type 2 diabetes don't respond well to medications that stimulate the pancreas to release more insulin, such as the sulfonylurea class of drugs (see Chapter 11). When these people are tested, they're found to have glutamic acid decarboxylase (GAD) antibodies similar to those found in type 1 diabetes (T1DM). This condition, called *latent autoimmune diabetes in adults* (LADA), is really adult-onset T1DM rather than type 2 diabetes (T2DM). It's generally milder than T1DM, with lower blood glucose levels, and it presents without ketosis or weight loss. The treatment is similar to that for T1DM.

TIP

If you're having trouble controlling your diabetes with oral drugs that work by causing more insulin release, ask your doctor to test you for GAD antibodies.

MODY

One to 5 percent of all patients with type 2 diabetes have a condition called *maturity onset of diabetes of the young* (MODY). Although most cases of type 2 diabetes

result from abnormalities in multiple genes, MODY results from an abnormality in a single gene of that patient. If one parent has MODY, their children have a 50 percent chance of inheriting the disease.

MODY can be diagnosed in any family with a high degree of inheritance of diabetes by doing genetic studies. Clinically, the disease looks like a mild form of type 2 diabetes that begins in early adolescence or early adulthood but isn't diagnosed until later in life (unless it's suspected in the family and a glucose tolerance test and genetic testing are done). It generally doesn't require insulin and it responds to oral agents (see Chapter 11).

POSSIBILITIES FOR FUTURE PREVENTION OF DIABETES

Researchers have performed many valuable studies on the prevention of type 2 diabetes. The results of these studies suggest that you can prevent diabetes, but probably only by making major lifestyle changes and sticking to them. Here are some important conclusions based on prevention research:

- Taking drugs that don't treat your insulin resistance doesn't help to prevent your diabetes or its complications.
- Exercising regularly can contribute significantly to lowering the risk of developing diabetes.
- Maintaining a proper diet can not only delay or prevent the onset of type 2 diabetes but can also provide substantial protection from many of the chronic conditions associated with it.
- Controlling both your blood pressure and your blood glucose has substantial benefits for preventing the complications of diabetes.

The results of the landmark Diabetes Prevention Program, a study of more than 3,000 people, were published in the *New England Journal of Medicine* in February 2002. They clearly showed that diet and exercise are effective in preventing type 2 diabetes. Participants who successfully modified their diet and exercise routines reduced their chances of developing type 2 diabetes by 58 percent. They generally did 30 minutes of moderate exercise (like walking) every day and lost between 5 and 7 percent of their body weight during the three-year study period. In contrast, patients who used a drug called metformin (see Chapter 10) without modifying their diet and exercise reduced their risk of developing type 2 diabetes by only 31 percent.

Another study, the Finnish Diabetes Prevention Study, shows that lifestyle changes can be accomplished and sustained not only in a research setting (like that of the Diabetes Prevention Program) but in a community setting as well, where patients are taken care of by their own doctors. Study participants worked with a nutritionist to improve their diets and received some advice on exercise. They continued to be successful after three years, with the same 58 percent reduction in the onset of diabetes.

Specifically measuring how closely people follow the Mediterranean diet has been shown to reduce the incidence of diabetes. Follow up over 20 years of more than 25,000 participants in the Women's Health Study showed a relative risk reduction of 30 percent in those who had high adherence to the Mediterranean diet. The way in which the diet worked was considered to be based on not only a reduction in BMI but also a decrease in insulin resistance and lower levels of inflammation. Results published in 2018 from a high-quality controlled study called Predimed that looked at the Mediterranean Diet in people who were at increased risk of cardiovascular disease showed a 53 percent reduction in incidence of diabetes over four years compared with those on a low-fat diet.

Dealing with Gestational Diabetes

If you already have diabetes when you become pregnant, it's called pregestational diabetes. However, you can also acquire a form of diabetes called gestational diabetes while you're pregnant, even if you've never had diabetes before. Gestational diabetes occurs in about 9 percent of all pregnancies. New research shows that women who develop gestational diabetes have a greater risk of developing type 2 diabetes later in life. As we discuss in Chapter 6, the difference between pregestational diabetes and gestational diabetes is very important in terms of the consequences for both parent and child.

During your pregnancy, you can acquire gestational diabetes because the growing fetus and the placenta create various hormones to help the fetus grow and develop properly. Some of these hormones have other characteristics, such as anti-insulin properties, that decrease your body's sensitivity to insulin, increase glucose production, and can cause diabetes.

Recognizing Other Types of Diabetes

Cases of diabetes other than type 1 and type 2 are rare and usually don't cause severe diabetes in the people who have them, but occasionally one of these other types is responsible for a more severe case of diabetes, so you should know that

they exist. The following list gives you a brief rundown of the symptoms and causes of other types of diabetes:

- **Diabetes due to loss or disease of pancreatic tissue:** If you have a disease, such as cancer, that necessitates the removal of some of your pancreas, you lose your pancreas's valuable insulin-producing beta cells and your body becomes diabetic. This form of diabetes isn't always severe because you lose glucagon, another hormone found in your pancreas, after your pancreatic surgery. Glucagon blocks insulin action in your body, so when your body has less glucagon, it can function with less insulin, leaving you with a milder case of diabetes.
- **Diabetes due to iron overload:** Another disease that damages the pancreas, as well as the liver, the heart, the joints, and the nervous system, is *hemochromatosis*. This condition results from excessive absorption of iron into the blood. When the blood deposits too much iron into these organs, damage can occur. This hereditary condition is present in 1 of every 200 people in the United States; half of those who have it develop a clinical disease, sometimes diabetes.

  TIP

  Hemochromatosis is less common in younger women, who are protected by the monthly loss of iron that occurs with menstrual bleeding. This finding has led to the current treatment for hemochromatosis, which is removing blood from the patient regularly until the blood iron returns to normal; then repeating the procedure occasionally to keep iron levels normal. If treatment is done early enough (before organs are damaged), complications such as diabetes are avoidable.
- **Diabetes due to other diseases:** Your body contains a number of hormones that block insulin action or have actions that are opposed to insulin's actions. You produce these hormones in glands other than your pancreas. If you get a tumor on one of these hormone-producing glands, the gland sometimes produces excessive levels of the hormones that act in opposition to insulin. Usually, this condition gives you simple glucose intolerance rather than diabetes because your pancreas makes extra insulin to combat the hormones, but if you have a genetic tendency to develop diabetes, you may develop diabetes in this case.
- **Diabetes due to hormone treatments for other diseases:** If you take hormones to treat a disease other than diabetes, those hormones could cause diabetes in your body. The hormone most likely to cause diabetes in this situation is hydrocortisone, an anti-inflammatory agent used in diseases of inflammation, such as arthritis. (Similar drugs are prednisone and dexamethasone.) If you take hydrocortisone and you have the symptoms of diabetes listed in earlier sections of this chapter, talk to your doctor.

ASK THE DOCTOR

WARNING

» **Diabetes due to other drugs:** If you're taking other commonly used drugs, be aware that some of them raise your blood glucose as a side effect. Some antihypertensive drugs, especially hydrochlorothiazide, raise your blood glucose level. Niacin, a drug occasionally used for lowering cholesterol, also raises your blood glucose. Even the wonder drugs for lowering cholesterol, the statins, have been implicated. If you have a genetic tendency toward diabetes, taking these drugs may be enough to give you the disease.

Recognizing "Type 3" and "Type 4" Diabetes

Although not formally adopted by organizations who define types of diabetes, you may hear these phrases used from time to time. Recent research has suggested that a possible link exists between insulin resistance and the commonest form of dementia — Alzheimer's disease. Some doctors have used the term *type 3 diabetes* to describe circumstances where these two factors may be linked. Certainly, some evidence now shows that lifestyle factors may play a part in preventing or delaying the onset of Alzheimer's disease, and certainly uncontrolled diabetes is associated with an increased risk of decline in cognition over time.

It has also been observed that some older people have increasing insulin resistance without necessarily being overweight. *Type 4 diabetes* is a proposed term to describe this circumstance.

Understanding Diabetes, Drivers of Inflammation, and Chronic Disease

In recent years, our understanding has developed beyond awareness of insulin resistance to reveal another key element involved in diabetes — chronic, low-grade inflammation. This knowledge is likely to be a game changer in the next decades, helping in the prevention and treatment of diabetes and its complications.

While acute inflammation is often a beneficial temporary response of our immune system to deal with invading microbes or foreign material, chronic inflammation that isn't targeted against pathogens in this way can lead to damage of the cells of our bodies and trigger and perpetuate the majority of common diseases.

We know that many chronic illnesses, ranging from heart disease through to stroke and many cancers to dementias, are characterized by signs of chronic inflammation in our system. We can measure these *biomarkers* in blood tests to show the extent to which our bodies are under inflammatory stress. Chronic inflammation can be driven by many things in our external and internal environment, such as smoking, pollution, and toxins, obesity, mental health problems, a less healthy gut microbiome, and especially poor diet and lifestyle factors. Particular foods have the capacity to drive or to put the brakes on inflammation, which may prove crucial in obesity and diabetes as well as other illnesses.

Newer evidence clearly suggests that chronic inflammation plays a significant role in the initiation and progression of diabetes. Scientists believe that chronic activation of pro-inflammatory pathways in target cells of insulin may contribute to obesity, insulin resistance, and the development of diabetes. Many of the complications of diabetes, such as heart disease and stroke, are also in themselves associated with chronic inflammation. Obesity is characterized by a state of increased inflammation, which means that there may be a vicious circle of chronic inflammation and weight gain. The good news here is that when you make changes to your lifestyle that counter chronic inflammation, this situation can be reversed, and a virtuous anti-inflammatory circle can take over.

In Part 3 of this book, we look in more detail at lifestyle changes that have been shown to reduce chronic inflammation and have the capacity to make a significant difference to diabetes and its complications.

2 Adopting a Multisystem Approach to Diabetes

IN THIS PART . . .

Discover how to maintain optimal health on a daily basis.

Prevent long-term complications of diabetes so that you can avoid eye disease, nerve disease, kidney disease, and heart disease.

Continue to enjoy your sexual function for your good health and happiness.

Know that being a healthy mother with diabetes and producing a healthy baby can be challenging but is very doable if you know how.

Understand your body's physiology to help you fully understand how diabetes affects you.

Realize that you can live a long and healthy life with diabetes through simple lifestyle strategies.

IN THIS CHAPTER

- Defining short-term complications
- Dealing with low blood glucose
- Handling very high blood glucose

Chapter 4

Maintaining Optimal Health on a Daily Basis

After receiving a diagnosis of type 2 diabetes, you need to understand how the disease can affect you. You can consider some of the signs and symptoms of diabetes to be short-term complications of the disease because they're generally mild and begin to subside when you start treatment. This chapter covers the more serious short-term complications, which occur when your blood glucose is out of control, reaching dangerously high or low levels.

WARNING

With the exception of mild *hypoglycemia* (low blood glucose that you can manage yourself), you should treat all the complications in this chapter as medical emergencies. Keep in touch with your doctor and go to the hospital promptly if your blood glucose is uncontrollably high or you're unable to hold down food. You may need a few hours in the emergency room or a day or two in the hospital to reverse your problems.

Taking Control and Preventing Short-Term Complications

Although the complications that we cover in this chapter are called *short-term*, you may experience them at any time during the course of your diabetes. *Short-term* simply means that these complications arise rapidly in your body, as opposed to the long-term complications (discussed in Chapter 5) that may take years to develop. Short-term complications develop in days or even hours and, fortunately, they respond to treatment just as rapidly.

Diabetes results in higher levels of glucose than normal, and the treatments explained later in this book are designed to reduce those levels to a healthy range. Short-term complications of diabetes can occur if glucose levels are too high because the condition is undiagnosed, untreated, or inadequately controlled. Alternatively, some short-term complications can arise if glucose levels are too low, perhaps due to the effects of treatment being too powerful in a particular situation — for example, if very effective glucose-lowering medications are working when for some reason you may be eating less than expected.

Sometimes you may experience the severe short-term complications associated with high blood glucose when you aren't monitoring your blood glucose levels. Small children and older folks who live alone or have illnesses are most susceptible to lapses in glucose monitoring and, therefore, to short-term complications. If you suffer an acute illness or trauma, you should monitor your glucose even more frequently than usual because you're more vulnerable to short-term complications.

The short-term complications of diabetes affect your ability to function normally. In particular, because your brain needs correct levels of glucose to function properly, levels that are too high or low can affect your capacity to think clearly, and very low levels especially can cause sudden loss of consciousness. For this reason, you may find that the Bureau of Motor Vehicles and the Federal Aviation Association and their international equivalents are extra careful about giving people with diabetes a driver's license or pilot's license. Potential employers may question your ability to perform certain high-risk jobs, but most companies and government agencies are very enlightened about diabetes and do everything possible to accommodate you in these situations.

HOW YOUR THOUGHTS AND EMOTIONS AFFECT YOUR HEALTH

When it comes to monitoring and taking control of your blood glucose, being aware of and attuned to your thoughts and emotions is important, so you can act promptly if your levels go too low or too high. In Chapter 8, we discuss nourishing yourself not only through what you eat but also in the emotional experiences of daily life. Feeling depressed may lead to less awareness of when things are going wrong or may result in ambivalence to taking swift action when needed. Alternatively, feeling nourished in body and mind is likely to result in a greater sense of empowerment to take control because you have a heightened awareness of your physical state and a greater ability to act to address any imbalance in your glucose control.

REMEMBER

You can control your diabetes, and all short-term complications are avoidable. If you take your medication at the appropriate time, eat the proper foods at the proper times, monitor your blood glucose regularly, and know how to respond when your levels fall or rise suddenly and unexpectedly, you're unlikely to suffer from any severe short-term complications. Your blood glucose may drop to lower than normal levels, but closely monitoring it quickly alerts you to the drop so you can treat it before it affects your mental and physical functioning. Similarly, if you are unwell or your glucose levels rise rapidly, you can stabilize the levels before any harm occurs with appropriate adjustments to your treatment. (See Chapter 7 for all the details on glucose monitoring and other testing.)

Being Aware of Low Glucose Levels: Hypoglycemia

The condition of having low blood glucose is known as *hypoglycemia*. If you have diabetes, you can get hypoglycemia only as a consequence of your diabetes treatment. A normal blood glucose is between 80 and 140 mg/dl. Hypoglycemia begins below 80 mg/dl, but you may not feel symptoms until it goes below 60 mg/dl.

Hypoglycemia is a potentially serious and life-threatening state, and the benefits of treatment for diabetes, which powerfully lowers blood glucose, must be weighed against the risks of episodes where levels may get too low. The chances of this happening and also of the dangers associated with hypoglycemia should be considered on an individual basis. If someone is ill or under higher amounts of stress, needs will differ.

"Tight" and accurate glucose control is the best way to prevent long-term complications; however, if suppressing the glucose too much increases the risks of hypoglycemia, particularly in elderly patients who may live alone and have less access to support in the event of sudden hypoglycemia, then it may be better to run blood glucose levels a little higher. Sometimes, it's possible to achieve control that is enough to prevent long-term complications such as eye disease, kidney disease, and nerve disease. However, preventing heart disease requires a lower glucose level that is difficult to sustain because of the threat of hypoglycemia, particularly for people with type 1 diabetes. This type of calculated risk may be necessary to balance safe short-term care with long-term consequences.

The positive news is that most patients experience complete recovery from the effects of hypoglycemia. If you experience hypoglycemia, you and your doctor can review how to adjust your treatment to reduce the risks of it occurring again.

FROM THE AUTHORS

From Dr. Simon Poole: An otherwise healthy person may make an appointment with their doctor because they're concerned they may have diabetes. A common complaint is that they feel exhausted or dizzy at different times of the day, perhaps when they're hungry, and they're worried that they may be experiencing times of low sugar caused by diabetes. Of course, this is a misperception. As we know, low blood sugar may be a result of the treatment of diabetes, but it's not a presenting symptom of untreated diabetes. There are a few uncommon medical conditions that in themselves can result in low blood glucose, but they're not diabetes and are beyond the scope of this book.

Identifying the signs of hypoglycemia

Your body doesn't function well when you have too little glucose in your blood. Your brain needs glucose to run the rest of your body, as well as to function intellectually. So when your body detects that it has low blood glucose, it sends out a group of hormones that rapidly raise your glucose. But those hormones have to fight the strength of the diabetes medication that has been pushing down your glucose levels. The fact that in a healthy state and without diabetes, your body can regulate blood sugar so well is an amazing and humbling tribute to physiology. Modern medicine attempts to achieve the same fine-tuning to correct diabetes, but it isn't an easy job.

At what level of blood glucose do you develop hypoglycemia? Unfortunately, the level varies for different individuals, particularly depending on the length of time that the person has had diabetes. But most experts agree that a blood glucose of 70 mg/dl (3.9 mmol/L) or less is associated with signs and symptoms of hypoglycemia in most people. This level is an *alert value.* If your blood glucose registers at this level, you should repeat the test in 20 minutes or so. Avoid driving or exercise until your glucose level improves.

Doctors usually put the symptoms of hypoglycemia into two categories:

- **Symptoms due to the side effects of the hormones (especially epinephrine) that your body sends out to counter the glucose-lowering effect of insulin:** This category of symptoms is called *adrenergic* symptoms because epinephrine comes from your adrenal gland. They occur most often when your blood glucose falls rapidly. The symptoms include
  - Whiteness, or pallor, of your skin
  - Sweating
  - Rapid heartbeat
  - Palpitations, or the feeling that your heart is beating too fast
  - Anxiety
  - Numbness in the lips, fingers, or toes
  - Irritability
  - Sensation of hunger
- **Symptoms due to your brain not receiving enough fuel, causing your intellectual function to suffer:** This category of symptoms is called *neuroglycopenic* symptoms, which is medicalese for "not enough (*penic*) glucose (*glyco*) in the brain (*neuro*)." (If your brain could speak, it would just say, "Whew, I'm ready for a meal!") These symptoms occur most often when your hypoglycemia takes longer to develop, and they become more severe as your blood glucose drops lower.
  - Headache
  - Loss of concentration
  - Visual disorders, such as double vision or blurred vision
  - Fatigue
  - Confusion and trouble concentrating
  - Trouble hearing
  - Poor color vision
  - Feeling of warmth
  - Slurred speech
  - Convulsions
  - Coma, or an inability to be awakened

People lose their ability to think clearly when they become hypoglycemic. They make simple mistakes, and and it may seem as if they're drunk.

TIP

If you take insulin or a *sulfonylurea* drug, which squeezes more insulin out of your reluctant pancreas, you should wear or carry with you some form of identification in case you unexpectedly develop hypoglycemia. (See Chapter 11 for a full explanation of insulin and the sulfonylurea medications.) For example, you can look for a bracelet that's engraved with vital information; they come in many styles to suit different tastes. The important thing is that the identification achieves the desired outcome, which is to alert another person to the fact that you have diabetes and may in some circumstances be unable to express what you need and require urgent medical attention.

Categorizing levels of hypoglycemia

The severity of hypoglycemia falls into three categories, defined by the level of the blood glucose:

- **Mild hypoglycemia:** With this level, corresponding to blood glucose of around 70 mg/dl (3.9mmol/l), patients can easily treat the issue. The hypoglycemia is discovered not so much by symptoms as by routine testing of the blood. It doesn't cause the patients to change their routine, other than taking a little glucose. Treatment may not even be necessary.
- **Moderate hypoglycemia:** Moderate hypoglycemia is considered moderate when the blood glucose is around 65 mg/dl (3.6mmol/l). Patients begin to feel the adrenergic symptoms described in the preceding section, especially anxiety and a rapid heartbeat. Patients who have moderate hypoglycemia may not recognize that they need glucose and may have to be helped by someone else.
- **Severe hypoglycemia:** This level, at which blood glucose is less than 55 mg/dl (3.1mmol/l), may leave patients severely impaired and thus requiring outside assistance to restore their glucose. An emergency injection of glucagon or intravenous glucose solution is often necessary.

TIP

The level of glucose that causes you to have mild, moderate, or severe hypoglycemia may differ from these numbers. They are only approximate. If you are alert with a blood glucose level of 55 mg/dl, taking glucose by mouth will reverse the hypoglycemia.

Managing the causes of hypoglycemia

Hypoglycemia results from elevated amounts of insulin driving your blood glucose to low levels, but an extra high dose of insulin or sulfonylurea medication isn't the only contributing factor. Your blood glucose level is also affected by the amount of food you take in, the amount of fuel (glucose) that you burn for energy, the amount of insulin circulating in your body, and your body's ability to raise glucose by releasing it from the liver or making it from other bodily substances.

On average, hypoglycemia in people with type 1 diabetes causes noticeable symptoms only about twice a week and is severe perhaps once a year. In people with type 2 diabetes, severe hypoglycemia occurs only one-tenth as often. The medications people with type 1 diabetes rely on (see the next section) are part of the reason that people with type 1 diabetes have to deal with hypoglycemia more often. But medications aren't the only contributors to hypoglycemia, and the following sections cover other causes and the ways you can manage those factors to keep your blood glucose level in check.

Insulin and sulfonylurea medications

All people with type 1 diabetes (and some with type 2) rely on insulin injections to control the disease. When you take insulin shots, you have to time your food intake to raise your blood glucose as the insulin is taking effect. Chapter 11 explains the different kinds of insulin and the proper methods for administering them. For now, the important thing to know is that the different types of insulin are most potent at differing amounts of time (minutes or hours) after you inject them. If you skip a meal or take your insulin too early or too late, your glucose and insulin levels won't be in sync, and you'll develop hypoglycemia.

If you go on a diet and don't adjust your medication, the same thing happens.

If you take sulfonylurea drugs, you need to follow similar restrictions. You and your doctor must adjust your dosage when your calorie intake falls. Other drugs don't cause hypoglycemia by themselves, but when combined with sulfonylureas they may lower your glucose enough to reach hypoglycemic levels. (Chapter 11 discusses these other drugs.)

Diet

Your diet plays a major role in helping you avoid hypoglycemia if you take medication. You should try to have a snack in the middle of the morning and in the afternoon — in addition to your usual breakfast, lunch, and dinner — especially if you take insulin. A properly timed snack provides you with a steady source of glucose to balance the insulin that you're taking.

TIP

You can use your blood glucose level to determine whether to have a snack at bedtime. If your glucose is greater than 180 mg/dL (10 mmol/L), you probably don't need a snack. If your glucose is between 126 and 180 mg/dL (7 to 10 mmol/L), a couple of slices of bread and an ounce of cheese will prevent hypoglycemia. If your glucose is less than 126 mg/dL (7 mmol/L), you will need to eat a little more.

Exercise

Exercise burns your body's fuel, which is glucose, so it generally lowers your blood glucose level. Some people with diabetes use exercise in place of extra insulin to get their high blood glucose down to a normal level. But if you don't adjust your insulin dose or food intake to match your exercise level, exercise can result in hypoglycemia.

FROM THE AUTHORS

One of Dr. Poole's patients is dedicated to exercise. He has taken insulin shots for years but requires very little insulin to control his glucose because he burns so much glucose through exercise. He avoids hypoglycemia by measuring his blood glucose level many times a day — especially before vigorous exercise. If his level is low at the beginning of exercise, he eats extra carbohydrates before he starts. Chapter 8 tells you which foods to eat (and when) to achieve the intended effect on your glucose levels.

Nondiabetes drugs

Several drugs that you may take unrelated to your diabetes can lower your blood glucose. One of the most widely used, which you may not even think of as a drug, is alcohol, which can block your liver's ability to release glucose. It also blocks hormones that raise blood glucose and increases the glucose-lowering effect of insulin. If you're malnourished or you simply haven't eaten in a while and you drink alcohol before going to bed, you may experience severe fasting hypoglycemia the next morning. If you take insulin or sulfonylurea drugs, don't drink alcohol without eating some food at the same time. Food counteracts some of the glucose-lowering effects of alcohol.

Also, be aware that aspirin (and all of the drugs related to aspirin, called *salicylates*) can lead to hypoglycemia. In adults who have diabetes, aspirin can increase the effects of other drugs that you're taking to lower your blood glucose. In children with diabetes, aspirin has an especially profound effect on lowering blood glucose to hypoglycemia levels. However, the low dose of aspirin taken daily to reduce the risk of heart attacks doesn't cause hypoglycemia.

WARNING

More than 160 drugs have been associated with severe hypoglycemia. Usually it's found in a person taking insulin or a drug that works by increasing the body's own insulin. Following are the major drugs that may cause hypoglycemia. If your physician decides that you need to be prescribed any of these medications, then they may need to make adjustments to your diabetes treatment to make allowances.

- **Angiotensin-converting enzyme inhibitors:** Blood pressure drugs, most of which end in *-pril*
- **Beta blockers:** Blood pressure drugs, most of which end in *-olol* (which also block the warning symptoms of hypoglycemia)
- **Pentamidine:** An antibiotic
- **Quinine:** Used to treat malaria
- **Quinolones:** A group of drugs that are antibiotics, most of which end in *-floxacin*

Hormonal changes

As type 1 diabetes progresses, your body produces fewer and fewer hormones that counteract insulin when hypoglycemia is present. This situation leads to more severe hypoglycemia later in type 1 diabetes, especially if you and your doctor don't adjust your insulin injections in response to your lower glucose levels. People with type 2 diabetes who take insulin also develop this loss of protective hormones.

These same hormones also play the role of giving you warning signs when your blood glucose drops, such as sweating, a rapid heartbeat, and anxiety, so you're prompted to eat. When the hormone levels drop, these warning signs don't occur, so you aren't signaled that you need to eat. This situation is called *hypoglycemia unawareness*. If hypoglycemia is avoided, however, the loss of the protective hormones and the development of hypoglycemia unawareness may be reversed.

Understanding the risks of hypoglycemia in special situations

Hypoglycemia is also present in a few special situations. We discuss them in this section.

- **Hypoglycemia with fasting:** When you fast, your body doesn't permit the glucose to fall to hypoglycemic levels. If you take no insulin or oral drug that raises insulin and you still become hypoglycemic during fasting, you may have an internal source of excessive insulin, such as a tumor of the beta cells of the

pancreas, an *insulinoma*. Insulinoma is easily diagnosed by having a person fast and checking the blood glucose over 72 hours. If it falls, the patient shows symptoms of hypoglycemia, and the insulin is elevated, a tumor of the pancreas is likely.

- **Hypoglycemia and intellectual changes:** Occasional severe hypoglycemia in younger people doesn't seem to have long-term consequences. The same isn't true for the elderly. An increasing incidence of loss of mental function (dementia) occurs as elderly patients have one, two, or three episodes of severe hypoglycemia. That's all the more reason for frequently checking blood glucose levels (at least once or twice daily with type 2 diabetes and four or more times daily with type 1 or type 2 on multiple shots of insulin per day).
- **Hypoglycemia and the heart:** Recent evidence suggests that hypoglycemia may be the cause of sudden unexplained death in young people with type 1 diabetes. Death may be caused by changes in the electrical rhythm of the heart. Hypoglycemia is often associated with low potassium, which can stop the heart. In patients with known heart disease, the highest death rate due to heart problems occurs at the lowest and highest blood glucose levels.

Treating hypoglycemia

Although hypoglycemia is preventable, you may still experience it at some point. Fortunately, the vast majority of cases are mild. You can treat hypoglycemia with a small quantity of glucose in the form of

- Two sugar cubes
- Three or four glucose tablets (available in any drugstore, and any person with diabetes who may develop hypoglycemia should carry them)
- A small amount (6 ounces) of a sugary soft drink
- 8 ounces of milk or 4 ounces of orange juice
- Anything that has about 15 grams of pure glucose in it

REMEMBER

Sometimes you may need a second treatment. Approximately 20 minutes after you try one of these solutions, measure your blood glucose to find out whether your level has risen sufficiently. If it's still low, give a second treatment.

Keep the following in mind to aid in your treatment of hypoglycemia:

- You can easily overtreat hypoglycemia, causing your blood glucose to rise higher than you'd like. However, the high blood glucose resulting from overtreatment of hypoglycemia usually doesn't last long. You're better off not using a drug or insulin to lower it because doing so can result in alternate highs and lows.
- Make sure that your friends or relatives know in advance what hypoglycemia is and what to do about it because your mental state may be mildly confused when you have it. Inform people about your diabetes and about how to recognize hypoglycemia. Don't keep your diabetes a secret. The people close to you will be glad to know how to help you.
- Try to eat a snack of carbohydrates and protein every hour if you're doing prolonged exercise, such as playing a baseball or soccer game that lasts several hours. (For example, half a turkey sandwich would work well.) Carry jelly beans (or any source of pure glucose) at all times — six or seven are all you need to combat mild symptoms of hypoglycemia.

WARNING

If you're losing consciousness and can't sit up and swallow properly when you have hypoglycemia, no one should try to feed you. One of the following options should be used:

- Someone helping you can use an emergency kit, such as the kit called "Glucagon for Emergencies." This kit includes a syringe with 1 mg of glucagon, one of the major hormones that raises glucose, which your helper should inject under your skin or into your muscle. The injection of glucagon raises your blood glucose so that you regain consciousness within 20 minutes. Glucagon corrects your hypoglycemic condition for about an hour after you receive an injection.

TIP

You need to get a prescription from your doctor for this type of glucagon kit. If you don't use your kit for a long time, make sure the date on the kit indicates that it's still active.

- If your hypoglycemia recurs shortly after you receive glucagon or doesn't respond to the glucagon, the person helping you should call for immediate medical assistance. (Sulfonylurea drugs are most often the cause of such a severe prolonged case of hypoglycemia.) The emergency crew checks your blood glucose and gives you an intravenous (IV) dose of high-concentration glucose. Most likely, you will continue the IV in the emergency room until you show stable and normal blood glucose levels.

Combating Ketoacidosis

In Chapter 3, we talk about the tendency of people with type 1 diabetes to suffer from a severe diabetic complication called *ketoacidosis,* or very high blood glucose with large amounts of acid in the blood. This section explains the symptoms, causes, and treatments of ketoacidosis.

The prefix *keto-* refers to *ketones* — substances that your body makes when fat breaks down during ketoacidosis. *Acid* is part of the name because your blood becomes acidic from the presence of ketones. Ketones can be measured in the blood and the urine.

TECHNICAL STUFF

Occasionally, ketoacidosis is the symptom that alerts doctors that you have type 1 diabetes, but more frequently, it occurs after you already know that you have the disease. Although ketoacidosis occurs mostly in people with type 1 diabetes (who develop diabetes at an early age), the person is usually 40 or more years old when ketoacidosis actually begins.

Ketoacidosis occurs mostly in people with type 1 diabetes because they have no insulin in their bodies except what they inject as medication. People with type 2 diabetes (or with other forms of the disease) rarely get ketoacidosis because they have some insulin in their bodies. People with type 2 diabetes get ketoacidosis mainly when they have severe infections or traumas that put their bodies under great physical stress.

The two most common causes of ketoacidosis are the interruption of your insulin treatment and an infection. Your body can't go for many hours without insulin activity before it begins to burn fat for energy and begins to make extra glucose that it can't use.

Common symptoms of ketoacidosis include increased thirst and frequency of urination, vomiting, rapid breathing, tiredness, headache, dry skin and mouth, stomach pain, muscles aches, flushing, and fruity-smelling breath. It can result in severe dehydration and dangerous disturbance to the balance of the levels of sodium and potassium in your blood. Ketoacidosis needs urgent medical attention to correct glucose levels, achieve rehydration, and rebalance levels of sodium and potassium (which can cause serious harm when they aren't in balance). Any underlying infection should be treated as well.

REMEMBER

Regardless of whether you have diabetes, if you go on a strict diet to lose weight, your body burns some of its fat stores and produces ketones, similar to how it burns fat when you lack insulin. But in this case, your glucose remains low, and (unless you have type 1 diabetes) you have sufficient insulin to prevent the excessive production of new glucose or the release of large amounts of glucose from

your liver. So a strict diet doesn't generally lead to ketoacidosis but rather a benign condition called *ketosis*.

Most of the time, your doctor can control ketoacidosis with little or no risk to you. But be aware that ketoacidosis is fatal for a small but significant percentage of people with diabetes who get it — mostly elderly people with diabetes and those with other illnesses that complicate treatment. Recognizing the symptoms early and seeking treatment quickly greatly enhance your chances of an uneventful recovery from ketoacidosis.

Managing Hyperosmolar Syndrome

The highest blood glucose condition that you may find yourself in is called *hyperosmolar syndrome*. Like ketoacidosis, hyperosmolar syndrome, referring to the excessive levels of glucose in the blood, is a medical emergency that needs to be treated in a hospital.

Hyperosmolar syndrome is also like ketoacidosis in its effects on your body. It creates ketones in your blood, but it doesn't make your blood as acidic as ketoacidosis does. However, it raises your blood glucose levels considerably higher than ketoacidosis does. (See the "Combating Ketoacidosis" section earlier in this chapter for more information.)

Hyper means "larger than normal," and *osmolar* has to do with concentrations of substances in the blood. So hyperosmolar, in this situation, means that the blood is simply too concentrated with glucose. Other hyperosmolar syndromes occur when other substances are at fault.

Heeding the symptoms of hyperosmolar syndrome

Because hyperosmolar syndrome is so similar to ketoacidosis, it has many of the same symptoms as ketoacidosis. The main difference is that with hyperosmolar syndrome, you don't experience rapid breathing called *Kussmaul breathing*, because your blood isn't overly acidic as a part of this complication. Also, the symptoms of hyperosmolar syndrome develop over many days or weeks, unlike the quick and acute development of ketoacidosis in your body.

If you measure your blood glucose on a daily basis, you should never develop hyperosmolar syndrome because you'll notice that your blood glucose is getting high before it reaches the critical complication level.

Following are the most important signs and symptoms of hyperosmolar syndrome:

- Frequent urination
- Thirst
- Weakness
- Leg cramps
- Sunken eyeballs
- Rapid pulse
- Decreased mental awareness or (if you delay treatment) coma
- Blood glucose of 600 mg/dl or even higher if you delay seeing a doctor

WARNING

You may also develop more threatening symptoms with this complication. Your blood pressure may be low. Your nervous system may be affected with paralysis of the arms and legs, but these problems respond to treatment.

Finding the cause

Hyperosmolar syndrome afflicts mostly elderly people with diabetes who live alone or in nursing homes where they're not carefully monitored. Age and usually some neglect combine to increase the likelihood that a person with diabetes will lose large quantities of fluids through vomiting or diarrhea and then not replace those fluids. These people tend to have mild type 2 diabetes, which is sometimes undiagnosed and untreated.

Another reason why age is a contributing cause of hyperosmolar syndrome is that your kidneys gradually become less efficient as you age. When your kidneys are in their prime, your blood glucose level needs to reach only 180 mg/dl before your kidneys begin to remove some excess glucose through your urine. But as your kidneys grow older and slower, they require a gradually higher blood glucose level before they start to send excess glucose to your urine.

If you're at an age (usually 70 or older for people in average health) when your kidneys are really laboring to remove the excess glucose from your body and you happen to lose a large amount of fluids from sickness or neglect, your blood volume decreases, which makes it even harder for your kidneys to remove glucose. At this point, your blood glucose level begins to skyrocket. If you don't replace some of the lost fluids quickly, your glucose rises even higher.

WARNING

If you allow your blood glucose to rise and don't get the fluids that you need, your blood pressure starts to fall and you get weaker and weaker. As the concentration of glucose in your blood continues to rise, you become increasingly confused, and your mental state diminishes until you eventually fall into a coma.

TIP

Other factors — such as infection, failure to take your insulin, and taking certain medications — can raise your blood glucose to the hyperosmolar syndrome levels, but not replacing lost body fluids is the most frequent cause.

Treating hyperosmolar syndrome

WARNING

Hyperosmolar syndrome requires immediate and skilled treatment from a doctor. By no means should you try to treat yourself. You need the proper treatment from an experienced doctor — and you need it fast. The death rate for hyperosmolar syndrome is high — ten times higher than that of diabetic ketoacidosis — because most people who suffer from it are elderly and often have other serious illnesses that complicate treatment.

When you arrive at your doctor's office or emergency room with hyperosmolar syndrome, your doctor must accomplish the following tasks fairly rapidly:

- Restore large volumes of water to your body
- Lower your blood glucose level
- Restore other substances that your body has lost, such as potassium, sodium, chloride, and so on

IN THIS CHAPTER

- Dealing with kidney, eye, and nerve diseases
- Understanding the effects of diabetes on the heart
- Recognizing risks to the blood vessels
- Preventing severe foot problems
- Identifying skin problems and other issues

Chapter 5

Preventing Long-Term Complications

The prevention of long-term complications from types 1 and 2 diabetes, which can develop over several years, is an important aspect of self-care. Diabetes can lead to disability and premature death through heart disease, stroke, lower limb amputation, kidney failure, and blindness. The World Health Organization reported diabetes to be the ninth leading cause of death in 2019 with an estimated 1.5 million deaths directly attributable to the disease and with a 5 percent increase in premature mortality recorded between 2000 and 2016.

In the context of rising rates of diabetes, this would seem to be unequivocally bad news; however, the report concludes with what we know to be true — long-term complications of diabetes are largely preventable through diet, physical activity, medication, and regular screening and treatment for conditions associated with diabetes.

Rates of complications quoted vary quite considerably depending on the population studied and the length of time since study participants received a diabetes diagnosis, the extent to which the diabetes is controlled, the access to screening

and treatment, and the levels of education about strategies to prevent complications. In some countries, rates of limb amputations and heart attacks have fallen, but this contrasts with countries where access to healthcare is limited and where health inequalities exist.

Early detection and awareness of diabetes is important because sometimes people are diagnosed with diabetes when complications are already occurring, and reversing complications is harder than preventing them in the first place.

The complications detailed in this chapter are the problems that occur if you permit your blood glucose to rise and remain high over many years. The point that we stress throughout this book is that you have a choice. By working with your doctor and other helpers, you can keep your blood glucose near normal so that you never have to deal with these long-term complications.

The Far-Reaching Effects of Diabetes: Taking a Holistic Approach

The complications of diabetes are linked with one another. Common characteristics include developing heart disease and kidney disease, nerve and eye damage, strokes, and problems with erections, so it'd be a mistake to think of each one in isolation.

Understanding the ways in which these conditions may develop is the key to their prevention. Although researchers are continuing to explore the exact details of how poorly controlled diabetes can result in such a variety of complications, we have enough knowledge to be able to explain some of the most important factors.

The *end-organ* damage of diabetes describes the disruption of the normal functioning of organs as far apart as the nerves in your feet to a stroke involving your brain. Although glucose in excess can have a directly harmful effect on cells, many of the complications of diabetes are due to persistently high glucose levels damaging blood vessels that supply these important parts of your body. This can be *macrovascular disease,* where the larger blood vessels such as those to the heart are affected, or *microvascular disease,* where the smaller blood vessels are compromised. The end result is end-organ damage.

Several theories explore how persistently high blood glucose causes vascular diseases and other damage to cells. One hypothesis describes how the body can handle normal levels of glucose, but when an excess occurs, the glucose can attach itself to other circulating molecules such as fats and proteins to form *Advanced Glycation End-Products* (AGEs). One such example is HbA1C, which is used as a

measure of how high glucose levels have been in the preceding few months, causing more or less of this glycated hemoglobin to form. It's believed that high concentrations of AGEs have the capacity to damage blood vessels.

Another way in which excess glucose can cause harm is when high levels of sorbitol accumulate in tissues. Sorbitol is a by-product of glucose metabolism that can cause the absorption of too much water into cells and can result in other chemical reactions and disruption. It can affect the immune system, structures in cells that include *mitochondria* — the tiny power hubs of cells — and even the way in which your genes work.

We may not be certain of the exact ways in which high glucose levels interfere with cell function and cause damage to blood vessels, but we do know that this sets the scene for chronic inflammation and *oxidative stress*, the imbalance between reactive oxidizing chemicals in cells and the ability to neutralize them. We discuss these concepts more in Chapter 8.

Knowing that many of the complications of diabetes are related to blood vessel damage (vascular disease) makes it very worthwhile to consider other factors that contribute to *cardiovascular* (heart) disease, *cerebrovascular* (stroke) disease, and *peripheral vascular* (limb blood vessel) disease. Smoking, high blood pressure, dyslipidemia (high cholesterol levels), obesity, poor diet, lack of exercise, and too much stress are all separate but related modifiable risk factors for vascular disease. When combined with diabetes, these conditions can dramatically increase the risk of heart attacks, strokes, and other major life-changing events associated with diabetes.

The flip side of this is, of course, that being empowered to achieve good glucose control, maintaining a normal blood pressure, attaining a healthy cholesterol level and body weight, enjoying a good diet and active lifestyle, as well as focusing on good mental health and self-care can all contribute to remaining well. Numerous studies have shown the benefits of lowered rates of complications not only with better glucose control measured by reductions in HbA1C but also when this is combined with other lifestyle improvements. Living a life free of complications of diabetes is possible. Programs to help people with diabetes and others understand more about the condition work. Diabetes education really does make a difference. That's why we're passionate about this project.

Kidney Health

Your kidneys rid your body of many harmful chemicals and other compounds produced during the process of normal metabolism. Your kidneys act like a filter through which your blood pours, trapping the waste and sending it out in your

urine while the normal contents of the blood go back into your bloodstream. They also regulate the salt and water content of your body. When kidney disease (also known as *nephropathy*) causes your kidneys to fail, you must either use artificial means, called *dialysis,* to cleanse your blood and control the salt and water or receive a new working donor kidney via a *transplant.*

Chronic kidney disease (CKD) is more prevalent now, and the major source of all these new cases is diabetes. In the United States today, half of the patients who require long-term dialysis require it because of diabetes. Fortunately, the number requiring dialysis is on the decline because people are more aware that they need to control their blood glucose. The incidence of kidney disease is only about 5 percent among people with type 2 diabetes, compared to 30 percent among people with type 1 diabetes; however, the absolute number of patients with kidney disease is about the same for the two groups because type 2 diabetes is so much more common than type 1.

CKD can be categorized into different levels. Some countries use a system where CKD1 is the mildest form and CKD4 the most severe. The measurement used to define the extent of the chronic kidney disease is often a blood test called the estimated glomerular filtration rate (eGFR), which is the degree to which the kidneys are doing their job of filtering the blood for toxins.

The following sections tell you what you need to know to prevent and manage diabetic kidney disease. We explain how diabetes affects your kidneys, what changes are occurring in your body, and how you can both check for them while they're still reversible and prevent them from getting any worse.

The impact of diabetes on your kidneys

Each kidney consists of about a million units called *nephrons.* Each nephron contains a structure called the *glomerulus* (the plural is *glomeruli*) that filters blood and separates out waste products and some water.

When you first get diabetes, your kidneys are enlarged and seem to function abnormally well, judging by how fast they clear wastes from your body. Your kidneys seem to function so well because you have a large amount of glucose entering your kidneys, which draws a lot of water with it and causes an increase in the pressure inside each glomerulus. This more-rapid transit of blood through the kidneys is known as an increased *glomerular filtration rate* (GFR). Early in the development of your diabetes, the membrane surrounding your glomeruli, called the *glomerular basement membrane,* thickens, as do other adjacent structures. These expanding membranes and structures begin to take up the space occupied by the capillaries inside the glomeruli, so the capillaries are unable to filter as much blood.

Fortunately, you have many more glomeruli than you really need. In fact, you can lose the equivalent of a whole kidney (half of each kidney) and still have plenty of reserve to clean your blood. If your kidney disease goes undetected for about 15 years, damage may become so severe that your blood shows measurable signs of the beginning of kidney failure, called *azotemia*. If the neglect of the disease reaches 20 years, both kidneys may fail entirely.

REMEMBER

Not every person with diabetes is at equal risk for kidney disease and kidney failure. For example, in the United States, this complication seems to be more common in certain families and among certain ethnic groups, especially people with African-American, Latino, and Native American heritage. It's certainly more common when high blood pressure is present. Although doctors and researchers believe that high blood glucose is the major factor leading to kidney disease caused by diabetes, only half of the people who have poorly controlled blood glucose go on to develop this condition.

Early indications of kidney disease

A healthy kidney permits only a tiny amount of *albumin*, a protein in the blood, to enter the urine. However, a kidney damaged by nephropathy is unable to hold back as much albumin, and the level in the urine increases, causing *microalbuminuria* (the presence of tiny but abnormally high amounts of albumin in your urine). If your kidneys are on their way to being damaged by *diabetic nephropathy* (kidney disease caused by diabetes), doctors can detect microalbuminuria in your urine.

TIP

For 75 percent of the patients in the early stages of kidney disease, however, the amount of albumin in the urine is so small that it won't trigger a positive result when the traditional urine dipstick test is used. Therefore, your doctor should perform a more sophisticated test for microalbuminuria. With the test, you collect a 24-hour urine specimen, meaning you save all the urine you produce in 24 hours and have it tested. If the level of albumin is abnormally high, it needs to be checked once again because some factors (such as exercise) can trigger a false positive test. A second positive test should lead to action to protect your kidneys. A more recently introduced and simpler single urine test is called the urinary albumin creatinine ratio (ACR). This has been shown to be similar in sensitivity to a 24-hour collection.

Because microalbuminuria can be detected about five years before a urine dipstick would test positive for albumin, you have time to treat the onset. Furthermore, treatment during the stage of microalbuminuria can reverse the kidney disease. After *macroalbuminuria* is found (indicating much larger amounts of protein in the urine) using the dipstick method, the disease can be slowed, but is more difficult to stop.

TIP

If you have had type 1 diabetes for five years or more, or if you've recently been diagnosed with type 2 diabetes, *your doctor must check for microalbuminuria* unless you've already tested positive for albumin with a urine dipstick. If your test comes back negative, you should have it rechecked annually.

WARNING

As many as 25 percent of patients with no microalbuminuria still have kidney disease, so treatment with drugs that protect your kidneys makes sense. For more information, we discuss these drugs, inducing ACE inhibitors, later in this chapter.

In June 2003 in the *New England Journal of Medicine*, researchers showed that microalbuminuria doesn't always lead to kidney failure. Patients with type 1 diabetes who improved their blood glucose levels, blood pressure, and abnormal blood fats (which we discuss in the next section) experienced a decline in microalbuminuria and, therefore, a decline in kidney damage.

Progressive changes in the kidneys

If diabetes is poorly controlled for five years or more, your kidney experiences a significant expansion of the *mesangial tissue*, the cells between the capillaries in the kidneys. The amount of microalbuminuria (discussed in the preceding section) correlates to the amount of mesangial expansion. Thickening of the glomerular basement membrane takes place at the same time but doesn't correlate as well with the amount of microalbuminuria.

Over the next 15 to 20 years, the open capillaries and tubules are squeezed shut by the encroaching tissues. Less and less filtration of the blood can take place, ultimately ending in *uremia*, a condition in which the kidneys aren't doing any cleansing.

This will result in a buildup of unwanted waste products in the blood. In particular, disturbances to levels of sodium, potassium, and calcium can have immediately life-threatening consequences.

Other factors besides high blood glucose contribute to the continuing destruction of the kidneys. They include the following:

- **High blood pressure (hypertension):** This factor may be almost as important as the glucose level. Your kidneys are very sensitive to blood pressure. If you use drugs to control your blood pressure, the damage to your kidneys slows very significantly.
- **Factors of inheritance:** Certain families and ethnic groups have a higher incidence of diabetic nephropathy, as we discuss in the section "The impact of diabetes on your kidneys," earlier in this chapter.

- **Abnormal blood fats:** Research shows that elevated levels of certain cholesterol-containing fats promote enlargement of the mesangium.

Diabetic nephropathy doesn't occur alone. If you experience kidney disease, you need to be aware that the following complications are associated with it:

- **Diabetic eye disease:** When someone experiences complete failure of the kidneys, called *end-stage renal disease,* diabetic retinopathy (eye disease) is almost always present (see the section "Eye Disease," later in this chapter). As kidney disease gets worse, retinopathy accelerates, but only half of the people with retinopathy also have nephropathy.

  TIP

  If you test positive for microalbuminuria, you'll likely also have some retinopathy if diabetes is the cause of your kidney problems. If you have diabetes and have microalbuminuria but retinopathy isn't present, your doctor should look for another cause of kidney disease besides diabetes.

- **Diabetic nerve disease (neuropathy):** Fewer than 50 percent of patients with nephropathy also experience diabetic nerve disease, or *neuropathy.* Neuropathy gets worse as kidney disease gets worse, but after dialysis has begun, some of the neuropathy disappears. This situation indicates that part of the neuropathy may be due to wastes that are retained because of the failing kidney rather than true damage to the nervous system. (For more on this condition, see the section "Nerve Disease, also known as Neuropathy," later in this chapter.)

- **Edema:** Edema, or water accumulation, in the feet and legs occurs as the amount of protein in the urine exceeds one or two grams a day.

Treatment for diabetic nephropathy

If the information in the previous section is making your blood pressure rise, take a deep breath. We're happy to report that all the inconvenience and discomfort associated with diabetic nephropathy can be avoided, and diabetes-related end-stage kidney disease (total kidney failure) is declining in all age groups, thanks to better control of glucose, blood pressure, and fat. Following are a few key treatments to prevent the disease or significantly slow it after it begins:

- **Control your blood glucose.** This crucial step has been shown to avoid the onset of nephropathy and to slow it after it starts. Both the Diabetes Control and Complications Trial (DCCT) in the United States, which studied glucose control in type 1 diabetes, and the United Kingdom Prospective Diabetes Study Groups in type 2 diabetes have proved this point. If you keep your

blood glucose close to normal, you won't develop diabetic nephropathy. (For information on controlling your blood glucose, see Part 3.)

One of the best findings from the DCCT is that even 20 years after the trial ended, participants experienced persistent benefits of reduced blood pressure and reduced albumin excretion (a marker for kidney damage). Controlling your blood glucose now will pay off years in the future.

- **Control your blood pressure.** This step protects the kidneys from rapid deterioration. Treatment begins with a low-salt diet and lifestyle measures, but medications called *antihypertensives* may be needed if your blood pressure remains high. You can control high blood pressure with a variety of medications that are protective of the kidneys, though some antihypertensives are better than others.

  One class of drugs, called the *angiotensin converting enzyme inhibitors*, or ACE inhibitors, seems particularly valuable in nephropathy with or without raised blood pressure. (For more on ACE inhibitors, see the sidebar "ACE inhibitors to the rescue," later in this chapter.) If ACE inhibitors can't be used for any reason, a similar class of drugs called *angiotensin II receptor blockers* are equally or more effective. Be especially alert for kidney damage if you have *white-coat high blood pressure* (WCH). This condition occurs in patients who have normal blood pressure at home but high blood pressure in the doctor's office. WCH has a high correlation with both kidney damage and eye damage.

- **Control the blood fats.** Because abnormalities of blood fats seem to make kidney disease worse, you must lower your bad, or LDL, cholesterol and raise your good, or HDL, cholesterol while lowering the other fat that is damaging — the triglycerides. A number of excellent drugs, in a class called *statins,* can accomplish this task. ACE inhibitors also seem to help the levels of fats. (See the sidebar on ACE inhibitors later in this chapter for more information.)

- **Avoid other damage to the kidneys.** People with diabetes tend to have more urinary tract infections (UTIs), which damage the kidneys. People with diabetes may also have damage to the nerves that control the bladder, producing a *neurogenic bladder.* (See the section "Recognizing disorders of automatic (autonomic) nerves," later in this chapter.) When the nerves that detect a full bladder fail, proper emptying of the bladder is inhibited, which can lead to infections.

REMEMBER

The kidneys often remove medications from the body conditions. If you have chronic kidney disease, you need to tell doctors and other health professionals so that they're aware and can avoid certain medications or adjust the dose. Failure to do so can result in potentially harmful levels of these drugs. Your doctors may choose to prescribe medications that are metabolized by the liver rather than excreted by the kidneys, for example, antibiotics. Some medications can cause not only kidney damage but also potentially life-threatening acute kidney injury or acute kidney injury (AKI) on top of existing chronic kidney disease.

If preventative treatments fail, you undergo dialysis or a kidney transplant.

When the kidneys fail, a main source for the breakdown of insulin is gone, and you require much less or no insulin, so control of blood glucose may actually get easier. You may also need to reduce or stop taking certain drugs because the failed kidneys no longer eliminate them.

- **Dialysis:** Two dialysis techniques are currently in use.
  - **Hemodialysis:** The patient's artery is hooked into a tube that runs through a filtering machine that cleanses the blood and then sends it back into the patient's bloodstream. When the patient is moderately well, hemodialysis is done three times a week in a dialysis center. The potential exists for many complications, including infection and low blood pressure.
  - **Peritoneal dialysis:** A tube is inserted into the body cavity that contains the stomach, liver, and intestines, called the *peritoneal cavity.* A large quantity of fluid is dripped into the cavity, and it draws out the wastes, which are then removed as the fluid drains out of the cavity. Peritoneal dialysis is done at home, often on a daily basis. Peritoneal dialysis requires the use of sugar in the fluid, so people with diabetes have very high blood glucose levels (which is undesirable) unless insulin is added to the bags of dialysis fluid. Alternatively, the patient's subcutaneous insulin doses are increased. Peritoneal dialysis is also associated with a high rate of infection where the tube enters the peritoneal cavity.

WARNING

Poor control of blood glucose during any form of dialysis is associated with a higher death rate. Make sure you control your glucose!

Little difference exists in the long-term survival of patients treated with hemodialysis compared with peritoneal dialysis, so the choice becomes one of convenience and whether insurance covers one procedure more than the other. People with diabetes don't tolerate kidney failure well, so dialysis tends to be started earlier in them than in people without diabetes.

- **Kidney transplant:** Patients who receive a kidney transplant seem to do better than dialysis patients, but in the United States, because of a lack of kidneys, 80 percent of patients have dialysis and 20 percent have a transplant. Obviously, a transplanted kidney is foreign to the person who receives it, and the body tries to reject it. To avoid this result, the patient is given antirejection drugs, some of which make diabetic control more complicated. The kidney that is least rejected is the one from a donor who is most closely related to the patient.

REMEMBER

When a healthy kidney enters the body of a person with diabetes, it's subject to the damage done by elevated glucose levels. After a transplant, controlling your blood glucose is crucial. At 85.5 percent, the five-year survival rate for kidney transplants is more than twice the 35.8-percent, five-year survival rate for dialysis patients.

ACE INHIBITORS TO THE RESCUE

The class of drugs called *angiotensin converting enzyme inhibitors,* or ACE inhibitors, has long been known to lower blood pressure. Recent studies show that these drugs also lower the pressure inside the *glomeruli* (the structures inside your kidneys that cleanse your blood). The result is a 50 percent reduction in death due to diabetic nephropathy and an equal reduction in the need for dialysis or a kidney transplant.

Your doctor should prescribe one of these medications if your blood pressure is 140/90 or higher. The target blood pressure is 120/80 in people with kidney disease and even lower in younger people. ACE inhibitors can even be used to reverse early kidney disease if you have microalbuminuria without hypertension, because the microalbuminuria suggests that there's increased pressure within the kidney. When ACE inhibitors are used, the excretion of albumin begins to fall; if you're leaking albumin into the urine, your urine albumin level can be used to monitor the drugs' effectiveness if your blood pressure is normal.

ACE inhibitors aren't perfect: They cause a cough in some patients, which some people find hard to tolerate, but the choice of a particular ACE inhibitor may solve this problem. In addition, ACE inhibitors tend to raise the potassium level in the blood. The potassium level is already an issue with failing kidneys, so a higher potassium level may add to the problem. A very high potassium level can cause abnormalities in the heart. Angiotensin II receptor blockers (ARBs) can replace ACE inhibitors when necessary and have also been shown to protect from kidney disease. They're not associated with the cough but do raise potassium.

Other drugs used for high blood pressure include the calcium channel blockers, which may be as useful as ACE inhibitors. Other antihypertensives that have been standards in the past for hypertension may cause unacceptable side effects. Water pills (diuretics such as hydrochlorothiazide) raise the blood glucose. Beta blockers like propranolol make the abnormal fats worse. They also cause a difficulty in recognizing when the blood glucose has gone down to very low levels.

Eye Disease

The eyes are the second major organ of the body affected by diabetes over the long term. Blurred vision, often present at diagnosis, is reversible with control of the glucose. Some eye diseases, such as glaucoma and cataracts, also occur in the nondiabetic population, though they appear at a higher rate and earlier in people with diabetes. Glaucoma and cataracts respond to treatment very well. Diabetic retinopathy, however — which we explain in the next section — is limited to the

diabetic population and may lead to blindness. In the past, blindness was inevitable, but that isn't the case today. In fact, after 20 years of diabetes, eye disease occurred in 30 percent of patients with type 1 diabetes before 1979, in 18 percent between 1980 and 1984, and in only 6 percent after 1984. This shows the significant progress in the treatment of Type 1 diabetes with better insulin control during the 1970s and 1980s.

In the following sections, you find out about the normal function of the eye and how diabetes can damage or even eliminate its function. You also discover the importance of early diagnosis through regular eye exams and how you can stop the progress of eye disease should it occur.

Noting common eye problems in people with diabetes

Light enters the eye through the lens, where it's bent and focused on the retina (see Figure 5-1). The place in the retina where the lens focuses is called the *macula.* The retina collects an image and transfers it to the optic nerve, which carries it to the brain, where the image is interpreted. Between the lens and the retina is a transparent material called the *vitreous body.* The eye muscles surround the eye on all sides and are attached to it. These muscles permit you to look up, down, and sideways without moving your head. These eye muscles are important in the discussion of diabetic nerve damage, called *neuropathy.* (For more on this condition, see the section "Nerve Disease, also known as Neuropathy," later in this chapter.)

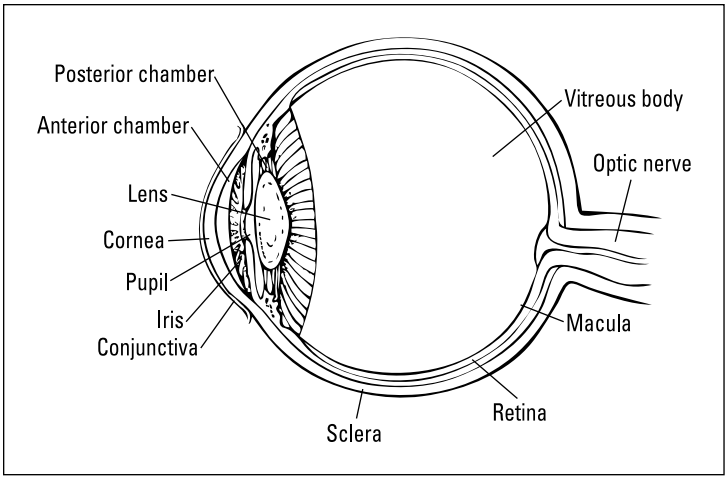

FIGURE 5-1: The structure of the eye.

Illustration by Kathryn Born

Following is a list of common eye diseases found in people with diabetes:

- **Cataracts:** These opaque areas of the lens can block vision if they're large enough. Cataracts tend to be more common in people with diabetes, even at a young age, both as a result of advanced glycated end-products (AGEs) that form within the lens and the increased concentration of sorbitol in the lens. Cataracts can be surgically removed by a fairly routine operation. The entire lens is removed, and an artificial lens is put in its place. With removal, you have an excellent chance for the restoration of your vision.
- **Glaucoma:** This condition, which is high pressure inside the eye, is enough to do damage to the optic nerve. Glaucoma is found more often in people with diabetes than in the nondiabetic population. If left unchecked, the high pressure can destroy the optic nerve and destroy your vision. Fortunately, medical treatment can lower the eye pressure and save the eye. Eye doctors check for glaucoma on a routine basis.
- **Retinopathy:** Diabetic retinopathy refers to a number of changes that are seen on the retina of the eye. These changes indicate that you've been exposed to high levels of blood glucose over time. If untreated at the appropriate time, retinopathy can lead to blindness. The first changes are seen after ten years of diabetes in both type 1 and 2. Because retinopathy is much more complicated and less treatable than the other two conditions, we discuss it in detail in the next section.

ASK THE DOCTOR

If you have diabetes, you must get an eye examination by an ophthalmologist or optometrist to preserve your vision. If no evidence suggests eye disease, you can get an exam every two years. This situation is one where an expert is definitely needed. Doctors who aren't ophthalmologists or optometrists diagnose retinopathy correctly only 50 percent of the time, whereas ophthalmologists and optometrists are correct more than 90 percent of the time. You need to get an eye exam as soon as you're diagnosed with type 2 diabetes or five years after the diagnosis of type 1 diabetes.

Eyeing the risks of retinopathy

Ophthalmologists break down *retinopathy* — damage to the retina caused by high blood glucose — into two major types according to their potential to cause visual loss:

- **Background retinopathy:** This type is usually benign but can be a predictor of worse problems. The first changes noted by the ophthalmologist are *retinal aneurysms,* which are the result of weakening of the capillaries of the eye; they produce *outpocketing* of the capillaries, which look like tiny balloons. These

aneurysms appear as small red dots on the back of the eye. They are benign and disappear over time.

The weakened capillaries also rupture sometimes and release blood to form retinal hemorrhages and hard *exudates.* The hard exudates, which are yellowish and appear round and sharp, are scars from the hemorrhage. If they extend into the macular area, they reduce vision. If the capillaries in the retina allow fluid to flow into the macula, you get *macular edema,* which also causes loss of vision. These exudates and hemorrhages can last for years. As the capillaries close, you have a decreased blood supply to the retina, and cotton wool spots or soft exudates appear. These spots represent destruction of the nerve fiber layer because of the lack of blood.

These changes usually don't cause complete loss of vision, but in about 50 percent of cases, they go on to the more serious proliferative retinopathy.

- **Proliferative retinopathy:** This condition results in vision loss if untreated. Just as in many other parts of the body, when the blood supply in the eye is reduced because of damage to the small blood vessels, new blood vessels form to compensate and carry more blood to the retina. This is the stage of proliferative retinopathy. This condition is when some visual loss becomes more certain. The growth of blood vessels takes place into the vitreous body. Hemorrhage into the vitreous body blocks vision. As the hemorrhage forms a clot and contracts, it may pull up the retina to produce *retinal detachment*. Because the lens can no longer focus the light onto the macula, you have a complete loss of vision.

Like diabetic nephropathy, retinopathy has a number of important associations:

- As a result of genetic material in their chromosomes, certain ethnic groups, including certain Native American groups like the Pima Indians and people of Latin heritage, are at very high risk for retinopathy,
- Males and females get retinopathy equally.
- Greater duration of diabetes results in more eye disease.
- High blood pressure may worsen the eye disease.
- Nephropathy occurs along with the eye disease. (See the "Progressive changes in the kidneys" section, earlier in this chapter.)
- Smoking worsens retinopathy, and alcohol abuse causes reduced visual acuity but not increased retinopathy.
- Patients with severe diabetic retinopathy are at increased risk for heart attacks. People with diabetic retinopathy are twice as likely to have a heart attack as people with diabetes who don't have retinopathy. If they have a heart attack, it's three times as likely to be fatal.

Treating advanced diabetic eye disease

Laser surgery that creates many burns in the retina to destroy the overgrowth of blood vessels has been an excellent treatment option and has been shown to save many eyes. Only 5 percent of diabetics with proliferative retinopathy who undergo laser treatment develop severe visual loss. Because the retina is being burned, you have some minor loss of vision. You also have a mild decrease in night vision and a minor decrease in the size of the field that your eye can take in at one time. Laser surgery also is used for successful treatment of macular edema.

Tight control of the blood glucose (maintaining a hemoglobin A1C under 7 percent) is associated with a much better response to laser surgery than loose control.

Laser surgery can't treat a retinal detachment that has already occurred. To do so, a surgical procedure called *vitrectomy* is used. This operation, done under general anesthesia, involves removing the vitreous body and replacing it with a sterile solution. Attachments to the retina are cut, and the retina returns to its place. Any hemorrhages in the vitreous body are removed at the same time. Vitrectomy is successful in restoring some vision about 80 to 90 percent of the time. If a retinal detachment is present in addition to hemorrhage, the amount of improvement depends on the extent and duration of the retinal detachment, with restoration of vision occurring about 50 to 60 percent of the time.

More recently, injections of a medicine called anti-VEGF have been shown to be an effective alternative to laser surgery in some situations, preventing deterioration and sometimes improving existing vision. The main ones used are ranibizumab (Lucentis) or aflibercept (Eylea). Although this may sound painful, the procedure can be dome in an outpatient setting and is over in a few minutes. The injection itself is generally over in less than 20 seconds and any discomfort is mild. At first, injections may need to be given once a month, but when the condition is stabilized, they can be administered less often. Another option is the injection of an implant that releases steroid medication over time. Your ophthalmologist can discuss with you which choice of treatment is most appropriate.

TIP

For more information, search for resources for the blind and visually impaired must begin on the internet. Undoubtedly, one of the best resources is the American Foundation for the Blind (AFB) at `www.afb.org`. It would take a good part of a lifetime to read all the resource materials that the AFB provides on thousands of web pages. The AFB is the organization that Helen Keller devoted her life to, and it has every imaginable resource.

Nerve Disease, Also Known as Neuropathy

The third major part of the body that's affected by poorly controlled diabetes is the nervous system. Sixty percent of people with diabetes have some abnormality of the nervous system. These patients usually don't realize it because nerve disease doesn't have any early symptoms. These patients typically may have poor glucose control, smoke, and be over age 40. Nerve disease is found most often in the people who have diabetes the longest. Diabetic neuropathy often leads to foot infections, foot ulcerations, and amputation — all preventable complications (see the section "Diabetic Foot Disease," later in this chapter). The sections that follow describe the basics of nerve disease as well as disorders associated with nerve disease.

Examining the basics of neuropathy

How high glucose levels damage nerves remains uncertain. Doctors do know that the *axon,* the part of the nerve that connects to other nerves or to muscle, becomes degenerated. The damage may be *vascular* in some cases, resulting from a cutoff of blood to the nerve, and *metabolic* in others, resulting from chemical toxins produced by the metabolism of too much glucose.

Diabetic neuropathy occurs in any situation where the blood glucose is abnormally elevated, usually for ten years or more. Therefore, it's not limited to type 1 or type 2 diabetes, although it's most commonly paired with these diseases. When the elevated blood glucose is brought down to normal, the signs and symptoms improve. In some cases, the neuropathy disappears.

The fact that intensive control of the blood glucose improves the neuropathy suggests that the disease is a consequence of abnormal metabolism that damages the nerves.

The speed with which a nervous impulse travels down a nerve fiber is called the *nerve conduction velocity* (NCV). In diabetic neuropathy, the NCV is slowed. This slowing may not be accompanied by any symptoms at first, and testing the NCV provides a way of diagnosing neuropathy in people without symptoms. If a patient who has very mild symptoms takes medication to control neuropathy, the improvement that follows may be hard to detect except by doing an NCV. Medication that helps the neuropathy is expected to speed up the NCV.

In addition to a persistently high blood glucose level, neuropathy is made worse by the following conditions:

- **Age:** Neuropathy is most common in people over 40.
- **Height:** Neuropathy is more common in taller individuals, who have longer nerve fibers to damage.
- **Alcohol consumption:** Even small quantities of alcohol can make neuropathy worse.

Doctors can test nerve function in a variety of ways because different nerve fibers seem to be responsible for different kinds of sensation, such as light touch, vibration, and temperature. The connection between the kind of test and the fiber it tests for is as follows:

- **Vibration testing:** Using a tuning fork, for example, can bring out abnormalities of large nerve fibers.
- **Temperature testing:** This uses a warm or cold item to test for damage to small fibers, which are very important in diabetes. When small fibers are damaged, a person can lose the ability to feel that they are entering a burning hot bath, for instance.
- **Light touch testing:** Perhaps the most important test that is done reflects the large fibers, which sense anything touching the skin. This test is done using a filament that looks like a hair. The thickness of the filament determines how much force is needed to bend the filament so that the person can feel it. For example, a person with normal feet can feel a filament that bends with 1 gram of force. If a person can feel a filament that bends with 10 grams of force, the person is unlikely to suffer damage to the foot without feeling it. If a person can't feel any sensation with a filament that requires 75 grams of force to bend, that area is considered to have lost all sensation.

  Either you or your doctor can use the 10-gram filament to discover whether you're at risk for damage to your feet because you can't feel the pain. This test takes a minute to do and can save your feet from amputation. (See the section about the diabetic foot, later in this chapter.)

Recognizing disorders of sensation

Disorders of sensation are the most common and bothersome disorders of nerves in diabetes because they're often associated with pain. They occur where the sensory nerves are damaged, and they include a number of different conditions that break down into two categories:

- **Diffuse neuropathies:** Involve many nerves
- **Focal neuropathies:** Involve one or several nerves

This section focuses on the diffuse neuropathies affecting sensation.

DISTAL POLYNEUROPATHY

Distal polyneuropathy is the most frequent form of diabetic neuropathy. *Distal* means far away from the center of the body — in other words, the feet and hands. *Poly* means many, and *neuropathy* is disease in nerves. So this disease concerns many nerves and is noticed in the feet and hands.

Physicians believe that distal polyneuropathy is a metabolic disease (a problem of too much glucose in the blood, specifically) because patients who have other diseases with a general abnormality of metabolism, such as kidney failure or vitamin deficiency, experience distal polyneuropathy as well.

The signs and symptoms of distal polyneuropathy are

- Diminished ability to feel light touch (numbness) or feel the position of a foot, whether bent back or forward, resulting from the loss of the large fibers
- Diminished ability to feel pain and temperature from loss of small fibers
- No significant weakness
- Tingling and burning
- Extreme sensitivity to touch
- Loss of balance or coordination
- Worsening of symptoms at night

The danger of this kind of neuropathy is that the person doesn't know, without looking, whether they have trauma to their feet, such as a burn or stepping on a tack. When the small fibers are lost, the symptoms are uncomfortable but not as serious. The person may feel pain when the bed covers are on their feet or other uncomfortable sensations. The majority of people with this condition are unaware of the loss of nerve fibers, and the disease is detected by nerve-conduction studies.

TIP

The complications of this loss of sensation are preventable. If you can't feel your feet, you must look at them. In the "Diabetic Food Disease" section later in this chapter, we offer specific techniques to preserve your feet when neuropathy is present.

The most serious complication of loss of sensation in the feet is the neuropathic foot ulcer. A person with normal nerve function feels pains when pressure mounts on an area of the foot. However, a person with diabetic neuropathy doesn't feel this pressure. A callus forms and, with continued pressure, the callus softens and liquefies, finally falling off to leave an ulcer. This ulcer becomes infected. If it isn't promptly treated, it spreads, and amputation may be the only way of saving the person. In this situation, loss of blood supply to the feet may not necessarily be an important contributing factor to the ulceration — in fact, the blood supply may be very good.

A less common complication in distal polyneuropathy is *neuroarthropathy*, or Charcot's joint. In this condition, trauma, which isn't felt, occurs to the joints of the foot or ankle. The bones in the foot get out of line, and many painless fractures may occur. The patient has redness and painless swelling of the foot and ankle. The foot becomes unusable and is described as a bag of bones.

Treatment of distal polyneuropathy starts with the best glucose control possible and extremely good foot care. Your doctor should look at your feet during each visit, particularly if you have any evidence of loss of feeling.

Some drugs can help in various ways, mainly with treating the symptoms of nerve pain, but a November 2014 study in the *Annals of Internal Medicine* couldn't conclude that any one of them is significantly better than the others:

- Nonsteroidal anti-inflammatory agents, like ibuprofen and sulindac, can reduce the inflammation. These medications can cause side effects, including bleeding from the stomach and kidney damage.
- Antidepressants, such as amitriptyline and imipramine, used in low doses may reduce the pain and other discomfort.
- Topical capsaicin creams reduce pain as well, but they may cause a burning sensation and cough.
- A drug called *gabapentin* has been found to work more often than many of the older drugs, but it can cause dizziness and sleepiness, which may make treatment more complicated.
- A spray of isosorbide dinitrate or trinitrate patches may be helpful.
- Alpha lipoic acid has been the subject of research, some of which has shown promise in treating diabetes neuropathy.
- Duloxetine (Cymbalta) has been effective for diabetic peripheral neuropathy in several clinical trials when compared to a placebo.

The results of these treatments vary and seem to work about 60 percent of the time. However, the longer the pain has been present and the worse the pain, the

less likely these drugs are to work. Always consult your doctor about the use of any of these medications.

POLYRADICULOPATHY-DIABETIC AMYOTROPHY

Polyradiculopathy-diabetic amyotrophy is a mixture of pain and loss of muscle strength in the muscles of the upper leg so that the patient can't straighten the knee. Pain extends down from the hip to the thigh. This nerve condition is second in occurrence after distal polyneuropathy in the diabetic population. Polyradiculopathy-diabetic amyotrophy generally has a short course but may continue for years and doesn't particularly improve with better diabetic control. Patients often improve only after the passage of time.

RADICULOPATHY NERVE-ROOT INVOLVEMENT

Sometimes a severe pain in a particular distribution suggests that the root of the nerve, as it leaves the spinal column, is damaged. The clinical picture is pain distributed in a horizontal line around one side of the chest or abdomen. The pain can be so severe that it's mistaken for an internal abdominal emergency. Fortunately, the pain goes away after a variable period of time — anywhere from 6 to 24 months. In the meantime, good glucose control and pain management are helpful.

Comprehending disorders of movement

Neuropathy can affect nerves to various muscles. Disorders of movement, called *mononeuropathy,* occur when you lose motor nerves that carry the impulses to muscles to make those muscles move. When you lose those nerves, you lose the ability to move or use those muscles. These disorders are believed to originate as a result of the sudden closing of a blood vessel supplying the nerve. The clinical picture depends on which nerve or nerves are affected. If one of the nerves to the eyeball is damaged, the person can't turn their eye to the side that nerve is on. If the nerve to the face is affected, the eyelid may droop or the smile on one side of the face may be flat. The patient can have trouble with vision or problems with hearing. Focusing the eye may not be possible. No treatment really exists, but fortunately, the disorder goes away on its own after several months.

Recognizing disorders of automatic (autonomic) nerves

Even as you're reading this page, many movements of muscles are going on inside your body, but you're unaware of them. Your heart muscle is squeezing down and relaxing. Your diaphragm is rising up to empty your lungs of air and relaxing to

draw air in. Your esophagus is carrying food from your mouth to your stomach and, in turn, your stomach pushes it into the small intestine, which pushes it into the large intestine. All these muscle functions are under the control of nerves from your brain, and diabetic neuropathy can affect all of them. The *autonomic nerves* handle all these automatic functions. Sensitive tests determine that as many as 40 percent of people with diabetes have some form of autonomic neuropathy.

The clinical presentation of this type of neuropathy depends on the involved nerve. Following are some of the possibilities:

- **Bladder abnormalities, starting with a loss of the sensation of bladder fullness:** The urine isn't eliminated, and urinary tract infections result. After a while, loss of bladder contraction occurs, and the patient has to strain to urinate or loses urine by dribbling. The doctor can easily diagnose this abnormality by finding out how much urine is left in the bladder after urinating. The treatment is to remember to urinate every four hours or take a drug that increases the force of bladder contraction.
- **Sexual dysfunction, which occurs in 50 percent of males with diabetes and 30 percent of females with diabetes:** Males can't sustain an erection, and females have trouble with vaginal dryness due to compromised blood supply to the nerves. (See Chapter 6 for more information on these problems.)
- **Intestinal abnormalities of various kinds:** The most common abnormality is constipation. In 25 percent of all patients with diabetes, nerves to the stomach are involved, so the stomach doesn't empty on time. This condition is called *gastroparesis*. It can lead to what's called *brittle diabetes,* where the insulin is active when there is no food. Fortunately, the drug metoclopramide may help to empty the stomach.
- **Involvement of the gallbladder, which leads to gallstones:** Normally, the gallbladder empties each time you eat, especially if you eat a fatty meal, because the substances in the bile (within the gallbladder) help break down fat. If disease of the nerve to the gallbladder prevents it from emptying, these same substances form stones.
- **Involvement of the large intestine that can result in diabetic diarrhea with as many as ten or more bowel movements in a day:** Accidental loss of bowel contents can occur, which can be very distressing. It is important to understand whether the diarrhea is caused by autonomic neuropathy, a side effect of diabetic medications such as metformin, or another cause that needs investigating. Taking too many artificial sweeteners can also cause loose stools. It's a common symptom with about 22 percent of patients with diabetes having symptoms of diarrhea.

- **Heart abnormalities:** If loss of nerves to the heart occurs, the heart may not respond to exercise by speeding up as it should. The force of the heart may not increase when the patient stands, and the patient then becomes lightheaded. A fast fixed heart rate also may occur, and the rhythm of the heart may not be normal. Such patients are at risk for sudden death.
- **Sweating problems, especially in the feet:** The body may try to compensate for the lack of sweating in the feet by sweating excessively on the face or trunk. Heavy sweating can occur when certain foods, such as cheese, are eaten.
- **Abnormalities of the pupil:** The pupil determines the amount of light let in by the eye. As a result of the neuropathy, the pupil is small and doesn't open up in a dark room.

Understanding entrapment neuropathies

Entrapment neuropathies result from squeezing of individual nerves as they pass through bony or ligamentous areas. Those areas don't allow expansion, so the nerve is trapped if swelling takes place for any reason. The entrapment neuropathies can produce symptoms similar to the mononeuropathies described in "Comprehending disorders of movement," but they differ in several ways:

- Onset of mononeuropathies is sudden, whereas entrapment neuropathies have a gradual onset.
- Mononeuropathies are self-limited, usually resolving over six weeks, whereas entrapment neuropathies can persist, and sometimes surgery is required to release the nerve.
- Mononeuropathies are painful from the start, but entrapment neuropathies tend to gradually get more and more painful.

Entrapment neuropathies are very common in people with diabetes, occurring in one in every three patients.

Following are the entrapment neuropathies:

- **Carpal tunnel syndrome:** Produces reduced sensation in the fingers and weakness touching the thumb to the fifth finger. The median nerve is trapped at the wrist.
- **Ulnar entrapment:** Produces reduced sensation in part of the fourth finger and the entire fifth finger as well as the hand between the fifth finger and the wrist. The ulnar nerve is trapped at the elbow.

- **Radial nerve entrapment:** Produces loss of sensation in the back of the hand and "wrist drop" from weakness of the muscles that straighten the wrist. The radial nerve is trapped at the elbow.
- **Common peroneal entrapment:** Produces loss of sensation in the side of the leg and top of the foot and "drop foot" from weakness of the muscles that pull up the foot. The common peroneal nerve is trapped as it passes the head of the fibula, one of the two bones that begin at the knee joint and end at the ankle.
- **Tarsal tunnel syndrome:** Produces loss of sensation on both sides of the foot and wasting of the muscles of the foot, resulting in decreased toe movement. It's like carpal tunnel syndrome in the foot and results from trapping of the tibial nerve between two of the small foot bones.
- **Lateral femoral cutaneous nerve entrapment:** Produces loss of sensation on the outside of the thigh but no muscle weakness. It results from trapping of that nerve at the groin.

The entrapment neuropathies respond to rest, splints, drugs that promote water loss, injections of steroids, and surgery if necessary. The important thing is not to confuse them with mononeuropathies.

You can see that you can run into all kinds of problems if you develop diabetic neuropathy. None of them need ever bother you, though, if you follow the recommendations in Part 3.

Heart Disease

In the last three decades, the number of deaths due to heart disease has fallen in some parts of the world, thanks to all kinds of new treatments as well as improved diets. However, the tremendous increase in the number of type 2 diabetes patients predicted for the next few decades may reverse this trend. In this section, you find out about the special problems that diabetes brings to the heart.

In the past, diabetic heart disease was considered disease of the large blood vessels (*macroangiopathy*). This sets it apart from eye, kidney, and nerve disease, which are considered diseases of the small blood vessels (*microangiopathy*). This idea was strengthened by the fact that microangiopathy responds to good blood glucose control but macroangiopathy doesn't. More recently, doctors and researchers believe that both kinds of complications have much in common. The large blood vessels in the heart, brain, arms, and legs are affected by the same metabolic abnormalities and structural abnormalities that affect the small blood vessels.

Controlling the blood glucose, the blood fats, and the blood pressure early in the disease help lessen or prevent coronary artery disease. However, good evidence suggests that intensive control isn't nearly as effective after an event such as a heart attack, stroke, or loss of blood flow to the leg has already occurred.

Risks of heart disease to diabetic patients

Coronary artery disease (CAD) is the term for the progressive closure of the arteries, which supply blood to the heart muscle. When one or more of your arteries closes completely, most often by a clot from a diseased and inflamed artery, the result is the permanently damaged muscle of a heart attack (or *myocardial infarction*). In diabetes, the incidence of CAD is increased even in the young type 1 patient. The duration of time with diabetes promotes CAD in type 1 patients. CAD affects males and females with type 1 diabetes in the same way.

TIP

Type 2 diabetes is different. CAD is the most common reason for death in type 2 patients. Women with type 2 are at increased risk for CAD compared to men. The following risk factors promote CAD in people with type 2:

- Increased production of insulin, caused by insulin resistance.
- Obesity.
- Central adiposity, which refers to the distribution of fat, particularly in the waist area.
- Hypertension (high blood pressure).
- Abnormal blood fats, especially elevated LDL (bad) cholesterol.

  Decreased HDL (good cholesterol) appears to correlate with coronary heart disease as well, but the goal is to lower LDL. The abnormal fats may persist even when the patient's glucose is controlled. People without diabetes but with impaired glucose tolerance may show the same abnormalities.
- Sitting time, especially long stretches of inactivity, such as watching television for a long time.

People with diabetes have more CAD than people without diabetes. When X-ray studies of the heart blood vessels are compared, people with diabetes have more arteries involved than people without diabetes.

WARNING

If a heart attack occurs, the risk of death is much greater for the person with diabetes. More than half of all people with diabetes die of heart attacks. If people without diabetes have heart attacks, they die 15 percent of the time, but people with diabetes die 40 percent of the time. The death rate is worse for people with

diabetes who poorly controlled their glucose before the heart attack. The same poorly controlled people have more complications, such as shock and heart failure, from heart attacks than people without diabetes. After a heart attack occurs, the outlook is much worse for diabetic people. A second heart attack occurs in 50 percent of people with diabetes (as opposed to 25 percent of people without diabetes), and the death rate in five years is 80 percent (versus 25 percent for people without diabetes).

The picture isn't a pretty one. The treatment options are the same for people with and without diabetes. Therapy to dissolve the clot of blood that is obstructing the coronary artery can be used, but people with diabetes don't do as well with *angioplasty,* the technique by which a tube is placed into the artery to clean it out and open it up. Newer techniques using certain chemicals in the tube are making this better therapy. People with diabetes do as well with surgery to bypass the obstruction (called *bypass surgery*) as people without diabetes, but the long-term prognosis for keeping the graft open isn't as good.

TIP

It has been believed that red wine (but not white wine) is good for your heart. Recent studies suggest that white wine has substances that are heart healthy as well, and both have alcohol, which is healthy in moderate amounts (two drinks daily for men and one for women).

Low-dose aspirin (81 milligrams or sometimes higher doses) has been effective in protecting the heart of some groups of patients with or without diabetes through its anti-inflammatory and anti-clotting effects. However research has sometimes given contradictory results about the risk and benefit assessment. It's important to discuss with your doctor your individual circumstances, including risk of bleeding — one of the side effects of aspirin.

TIP

Waist-to-height ratio, or the waist in inches divided by the height in inches, is the best predictor of the risk of heart attacks and deaths in obese diabetic patients. A waist-to-height ratio under 0.5 is considered healthy. Other criteria are the waist circumference (less than or equal to 40 inches in men and 35 inches in women is lower risk), followed by the waist-to-hip ratio (under 0.9 in men and 0.8 in women is healthy).

Studies indicate that body-mass index (BMI) isn't a good predictor of heart attacks and death in obese diabetic patients

Metabolic syndrome

The earliest abnormality in type 2 diabetes is insulin resistance, which is found in people even before diabetes can be diagnosed. People with impaired glucose tolerance, and even 25 percent of the population with normal glucose tolerance, have

evidence of insulin resistance. The condition, formerly known as *insulin-resistance syndrome*, is now called *metabolic syndrome.* It's particularly worrisome because it's being found in obese children and adolescents, resulting in greater danger of diabetes and an early heart attack in these children. The next 20 years will reveal how these risks play out.

Linking metabolic syndrome and insulin resistance

Several features accompany insulin resistance, which is associated with three times the incidence of coronary artery disease compared to people with normal insulin sensitivity:

- **Hypertension:** High blood pressure may be a consequence of the increased insulin required to keep the glucose normal when a patient is insulin resistant. When people are given insulin to control glucose, a rise in blood pressure often occurs.
- **Abnormalities of blood fats:** The level of triglycerides is elevated, as is the amount of small, dense LDL (a particle in the blood that carries bad cholesterol). At the same time, you see a decline in the amount of HDL, the good cholesterol particle that helps clean out the arteries.
- **Microalbuminuria:** The presence of microalbuminuria strongly correlates with the development of coronary artery disease. (See the section "Early indications of kidney disease," earlier in the chapter.)
- **C-reactive protein:** This marker for inflammation in the body (easily obtained by a blood test) rises as the severity of the metabolic syndrome increases. It indicates that inflammation plays an important role in coronary artery disease.
- **Increased plasminogen activator inhibitor-1:** This chemical, which blocks the activity of plasminogen activator, prevents the breakdown of blood clots that form in the arteries of the heart and other areas.
- **Increased abdominal visceral fat:** You can lose a lot of this fat, which is found at the waistline, by dieting and losing 5 to 10 percent of your body weight.
- **Obesity:** Many people with metabolic syndrome are obese, but not all. Likewise, many people who are obese don't have metabolic syndrome.
- **Sedentary lifestyle:** This feature is also often found, but an active lifestyle doesn't preclude metabolic syndrome.

The preceding features, plus others, are found in people who have an increased tendency to have coronary artery disease and heart attacks. Keep in mind that metabolic syndrome may be present even when diabetes isn't. Metabolic syndrome is probably a primary abnormality and not a consequence of an elevated blood glucose over time.

Finding out who's at risk

Metabolic syndrome is present when three or more of the following conditions are present:

- Waist circumference in men greater than 40 inches and in women greater than 35 inches
- Fasting triglyceride greater than or equal to 150 mg/dl
- Blood pressure greater than or equal to 130/85
- HDL cholesterol less than or equal to 40mg/dl in men and 50 mg/dl in women
- Fasting glucose greater than or equal to 110 mg/dl
- Abnormal glucose tolerance (glucose level of 140–199 two hours after 75 gm of glucose)

People who are at the top of the normal weight curve and slightly overweight have also been found to have metabolic syndrome. You don't have to be obese.

TIP

Unexpectedly, people who consume diet sodas daily have been found to have an increased risk of metabolic syndrome and type 2 diabetes. The marketing of such drinks, with the implication that they will prevent obesity and type 2 diabetes, is often misleading. We cover this more in Chapter 8.

Although alcohol consumption up to the daily guideline of one drink for women and two drinks for men may be protective against heart disease, drinking more than that or binge drinking one or more days per week is associated with an increased risk of metabolic syndrome and its complication of heart disease.

Treating metabolic syndrome

A number of treatments are available for metabolic syndrome. If you're obese and have a sedentary lifestyle, you should correct these problems. Even a small amount of weight loss or exercise can make a major contribution toward decreasing the risk of a heart attack. An exercise training program has reversed metabolic syndrome in 30 percent of patients.

Many features of metabolic syndrome are dependent on an abnormal blood glucose. Modifications to diet (discussed in Chapter 8) can reverse these features, including elevated triglyceride, elevated blood pressure, reduced HDL cholesterol, fasting glucose, and glucose tolerance.

Studies have found a variability in the prevalence of metabolic syndrome by occupation. Food preparation and food service workers have the highest risk. About 30 percent of them have been found to have metabolic syndrome. The groups of writers, artists, entertainers, athletes, engineers, architects, and scientists have the lowest risk, at about 9 percent.

Cardiac autonomic neuropathy

We discussed cardiac autonomic neuropathy briefly in the section on neuropathy earlier in this chapter. Basically, the heart is under the control of nerves, and high glucose levels can damage these nerves. Your doctor can test for this condition in a number of ways:

- **Measure the resting heart rate:** It may be abnormally high (greater than 100).
- **Measure the standing blood pressure:** It may fall abnormally low (a decrease of 20 mm sustained for 3 minutes) compared to the sitting blood pressure.
- **Measure the variation in heart rate when inhaling compared to exhaling:** The variation may be abnormally low (under 10).

The presence of cardiac autonomic neuropathy results in a diminished survival even among patients who don't have coronary artery disease.

Cardiomyopathy

Cardiomyopathy refers to an enlarged heart and scarring of the heart muscle in the absence of coronary artery disease. As a result, the heart doesn't pump enough blood with each stroke. The patient may be able to compensate by a more rapid heart rate, but if hypertension is present, a stable condition can deteriorate.

TIP

The key treatment in this condition is control of the blood pressure as well as control of the blood glucose. Studies in animals in which diabetic cardiomyopathy has been induced have shown healing by controlling the blood glucose.

Diabetic Blood Vessel Disease Away from the Heart

The same processes that affect the coronary arteries can affect the arteries to the brain, producing cerebrovascular disease, and the arteries to the rest of the body, producing peripheral vascular disease. We explain each condition in the following sections.

Peripheral vascular disease

Peripheral vascular disease (PVD) occurs much earlier in people with diabetes and proceeds more rapidly. This clogging of the arteries to parts of your body other than the heart and brain results in the loss of pulses in the feet; ten years after diagnosis, a third of people with diabetes no longer feel a pulse in their feet. The most common symptom of PVD is intermittent pain in the calves, thighs, or buttocks that begins after some walking and subsides with rest. People with PVD have a reduction in life expectancy. When PVD occurs, just as when CAD occurs, it's much worse in people with diabetes because more of their arteries are involved.

The major screening test for peripheral vascular disease is the ankle-brachial index (ABI). The systolic blood pressure in the ankle is divided by the systolic blood pressure in the arm. A result of 0.95 or greater is normal. A result of less than 0.75 suggests serious peripheral vascular disease. Some people with diabetes have a lot of calcium in their arteries and get a higher blood pressure in the ankle than the arm.

WARNING

If the ABI is more than 1 and the systolic blood pressure in the ankle is more than 300 mm mercury or 75 greater than the arm, this condition also suggests PVD.

An ABI in a person with diabetes that is less than 0.9 is associated with a much higher risk of death from a heart attack.

In addition to diabetes, certain risk factors increase the severity of PVD. The following risk factors are unavoidable:

- **Genetic factors:** PVD is more common in some families and certain ethnic groups, especially among Black people.
- **Age:** The risk of PVD increases as you age.

The following risk factors are within your control:

- Smoking, which promotes early foot amputation
- Hypercholesterolemia (high cholesterol)
- High glucose
- Hypertension
- Obesity

WARNING

In addition to controlling the preceding factors as much as possible, you may need to take drugs that help prevent closure of the arteries and loss of blood supply. Aspirin, which inhibits clotting, is among the most useful. Pentoxifylline (Trental) improves the circulation of cells in the blood. In addition, exercise improves blood flow and promotes the development of blood vessels around an obstruction. If none of these measures reverses the symptoms, some form of surgery that opens or bypasses the blocked arteries may be necessary.

Smoking and diabetes

Smoking has a number of ill effects on people without diabetes, but the effects are even worse in people with diabetes. Current smokers and those former smokers who have stopped but smoked for 15 years or more have felt these bad effects. Among other things, smoking has the following consequences:

- Reducing blood flow in arteries and blocking increased flow when it's needed
- Increasing pain in the legs in people with peripheral vascular disease and in the heart in people with coronary artery disease
- Increasing *atheromatous plaques,* the changes in arteries in the heart and other areas (like the brain and the legs) that precede closing of the blood vessels and are part of the inflammatory and clotting in CAD
- Increasing clustering of *platelets,* the blood elements that form a plug or clot that blocks the artery
- Increasing blood pressure, which also worsens atheromatous plaques

These problems don't even take into account the effects of smoking on the lungs, the bladder, and the rest of the body.

Cerebrovascular disease

Cerebrovascular disease (CVD) is a disease of the arteries that supply the brain with oxygen and nutrients. The information about peripheral vascular disease in the preceding section also covers cerebrovascular disease, with some exceptions. The risk factors and the approach to treatment are similar. However, the symptoms are very different because the clogged arteries in CVD supply the brain.

If a temporary reduction in blood supply to the brain occurs, the person suffers from a *transient ischemic attack* (TIA). This temporary loss of brain function may present itself as slurring of speech, weakness on one side of the body, or numbness. TIA may disappear after a few minutes, but it may come back again some hours to days later. If a major artery to the brain completely closes, the person suffers a stroke. Fortunately, stroke victims who are seen soon enough after the stroke can take advantage of clot-dissolving materials.

Disruption to the blood supply from one of the major arteries to the brain can cause a disabling stroke. A stroke can be treated and potentially reversed if medical attention is sought as early as possible. Symptoms of a stroke are a medical emergency. It's useful to apply the FAST protocol:

Facial weakness

Arm weakness

Speech problems

Time to call the emergency services!

Symptoms can be different, but the FAST protocol is certainly useful for a typical stroke presentation.

When smaller blood vessels are affected, there may not be such sudden and obvious symptoms. People may have more subtle symptoms, including decline in cognition. This may lead to a diagnosis of dementia. Because this dementia is a consequence of blood vessel disease, it's called *vascular dementia*. We discuss dementia in more detail in Chapter 15.

WARNING

People with diabetes are at increased risk for CVD just as they are for PVD. Their disease tends to be worse than the disease in a person without diabetes, and they can have blockage in many small blood vessels in the brain that leads to the loss of intellectual function, a symptom similar to Alzheimer's disease.

The treatable risk factors for CVD are the same as those for PVD (see the preceding section). You should attempt to improve them, particularly high blood pressure.

Diabetic Foot Disease

Diabetic foot disease can be a combination of neuropathic effects and vascular deficiency, and it can be complicated by the increased risk of infections and difficulties in healing experienced by people with diabetes. A minor injury, perhaps because of poor sensation in an area with compromised blood supply, can sometimes result in a dying tissue and finally the need for amputation.

REMEMBER

Good medical care can prevent amputations. Your doctor should look at your feet as routinely as they measure your weight.

In the section on neuropathy, earlier in this chapter, we point out that a filament that requires a pressure of 10 grams to be felt can differentiate a person who won't suffer damage to the feet under normal walking conditions from a person who will. All doctors who have patients with diabetes should have this filament to test the feet at least annually. Even better, you should have your own filament and test yourself any time you feel like it. If you can't feel the filament, you had better start looking at your feet every day. See Chapter 7 for information about where to obtain a filament.

If your feet are dry, you may have loss of sweating. Loss of sweating is usually accompanied by the loss of touch sensation and the development of ulcers. You need to moisturize your feet, first by soaking them in water (which you test with your hand for its temperature), and then by drying them with a towel and applying a moisturizer. Soaking should always be accompanied by drying and moisturizing.

Ulcers of the foot can develop in a number of ways:

- Constant pressure
- Sudden higher pressure
- Constantly repeated moderate pressure

TIP

It takes very little pressure, if constantly applied, to damage the skin. If you have diminished sensation, some of the following tips may save your feet:

- Change your shoes about every five hours.
- If you have new shoes, change them every two hours at first. Your shoes shouldn't be too tight or too loose.
- Never walk barefoot.

- Shake out your shoes before you put them on.
- Inspect your feet daily, with a mirror if necessary.
- Don't use a heating pad on your feet.
- Stop smoking. If you smoke, you greatly increase your risk for an amputation.

If you develop an ulcer, the treatment is to take pressure off the site by resting the foot and elevating it. When the infection is localized in a foot with adequate blood supply, a plaster cast is applied to overcome the natural tendency to want to stand or walk. The cast protects the ulcer from slight trauma that could prevent healing.

A product called becaplermin (Regranex Gel) has been shown to speed the healing of deep diabetic foot ulcers when it's combined with good wound care. (Good wound care means carefully removing dead tissue and keeping your weight off the ulcer, along with treating any infection and controlling your blood glucose.) The product is applied to a clean wound bed once daily. You should see significant reduction in the size of the ulcer within 10 weeks and complete healing by 20 weeks. The long duration for healing is a problem, because Regranex Gel is very expensive. However, a typical deep diabetic ulcer is very expensive to treat in any case, and if this product can speed up your healing, it may be worthwhile. Patients with known malignancy shouldn't use Regranex Gel.

REMEMBER

We must reiterate that ulcers of the foot, which can lead to amputation in people with diabetes, are entirely preventable. If your feet lack sensation, your doctor must examine them at every visit, and you must examine them daily. At the first sign of a problem, take appropriate action. Don't attempt to treat potentially serious and worsening ulcers yourself. Always seek appropriate medical advice and care.

Skin Disease in Diabetes

Many conditions involving the skin are unique to diabetic people because of the treatment and complications of the disease. Following are the most common and important skin complications:

- Bruises occur due to the cutting of blood vessels by the insulin needle.
- *Vitiligo* (loss of skin pigmentation) is part of the autoimmune aspect of type 1 diabetes and can't be prevented.

- *Necrobiosis lipoidica,* which also affects people without diabetes, creates patches of reddish-brown skin on the shins or ankles, and the skin becomes thin and can ulcerate. Females tend to have this condition more often than males. Steroid injections are used to treat this condition, and the areas eventually become depressed and brown.
- *Xanthelasma,* which are small yellow flat areas called plaques on the eyelids, occur even when cholesterol isn't elevated.
- *Alopecia,* or loss of hair, occurs in type 1 diabetes. It's considered an autoimmune disease, like type 1 diabetes.
- *Insulin hypertrophy* is the accumulation of fatty tissue where insulin is injected. Moving the injection site around can prevent this condition.
- *Insulin lipoatrophy* is the loss of fat where the insulin is injected.

  Although the cause is unknown, this condition is rarely seen now that human insulin has replaced beef and pork insulin (see Chapter 10).
- Dry skin is a consequence of diabetic neuropathy, which leads to a lack of sweating.
- Fungal infections occur under the nails or between the toes. Fungus likes moisture and elevated glucose. Lowering your glucose and keeping your toes dry prevent these infections. Medications may cure this problem, but it recurs if glucose and moisture aren't managed.
- *Acanthosis nigricans,* a velvety-feeling increase in pigmentation on the back of the neck and the armpits, causes no problems and needs no treatment. This condition is usually found when insulin resistance exists. It's seen in adults and children with type 2 diabetes.
- Diabetic thick skin, which is thicker than normal skin, occurs in people who have had diabetes for more than ten years.

Gum Disease in Diabetes

The major problem that people with diabetes may have in their mouths is gum disease. This problem develops because the higher concentration of glucose in the mouth promotes the growth of germs, which mix with food and saliva to form plaque on your gums. If you don't brush your teeth twice a day and floss your teeth once a day, the plaque may harden into tartar, which is very hard for you to

remove. The gums may develop gingivitis, becoming brittle and bleeding easily. You may experience pain and bad breath, and eventually the gums may become so weakened that they can't support your teeth.

Controlling your blood glucose is a key step in preventing gum disease. Visiting your dentist for routine cleanings of your teeth twice a year is another important way to keep your gums healthy. Interestingly, people with diabetes don't seem to develop cavities more often than people who don't have the disease.

Sleep Apnea

Sleep apnea is another complication of obesity, and it can lead to metabolic syndrome and type 2 diabetes. Sleep apnea is characterized by recurrent episodes, lasting 10 to 30 seconds each, of failure to breathe while asleep. These episodes are due to obstruction of the airway due to extra fat in the neck or nerve disturbances. As many as 60 to 90 episodes may occur per hour, during which the oxygen saturation of the blood drops to as low as 50 percent (normal is greater than 95 percent).

In a 2009 study of more than 300 patients with type 2 diabetes and obesity, over 86 percent of the patients had obstructive sleep apnea. Waist circumference was a key indicator of obstructive sleep apnea.

Sleep apnea makes the patient very sleepy the next day, which results in slow reactions, poor memory and concentration, and irritability. Sleep apnea also causes increased blood pressure and increased insulin resistance by unclear mechanisms. Sleep apnea increases the risk of heart disease. The reduction in oxygen in the blood may also increase damage to the kidneys, leading to nephropathy. Finally, the severity of the sleep apnea correlates with the severity of poor glucose control.

When obstructive sleep apnea is due to upper airway obstruction, it can be improved or even cured by treating an underlying condition such as low thyroid function or a tumor of the pituitary gland producing excessive growth hormone (acromegaly) if this is present. Maintaining weight loss may improve the obstructive sleep apnea. If not, then a positive pressure device worn on the face, a CPAP machine, should greatly improve the condition; unfortunately, many patients find it uncomfortable.

Other Conditions Associated with Diabetes That You Should Know

Aside from the complications already covered in this chapter, diabetes can exacerbate or is connected to the following conditions:

- Diabetes increases the risk of death from breast, liver, and colon cancer.
- Diabetes is associated with a high incidence of arthritis and bone fractures.
- *Psoriasis,* an autoimmune skin condition of raised, red, scaly patches, has a high incidence of associated diabetes.
- Older people, especially those on insulin, have a higher incidence of falls requiring hospitalization than those without diabetes.
- Diabetes is associated with an increased risk of cognitive impairment, memory loss and Alzheimer's disease. Diabetes can cause vascular dementia, but it's also associated with an increased risk of other types of dementia, including Alzheimer's. One study showed that people with high glucose levels had a far greater amount of beta amyloid protein in their brains — one of the hallmarks of Alzheimer's dementia. The exact mechanism is unknown, but it's thought that chronic inflammation and oxidative stress linked to diabetes may play a part.

IN THIS CHAPTER

- Exploring common sexual issues in men with diabetes
- Dealing with female sexual problems
- Coping with diabetes in pregnancy
- Recognizing polycystic ovarian syndrome

Chapter 6

Preserving Sexual Function and Protecting Pregnancy

This chapter describes everything you need to know about sexual function and diabetes in pregnancy from start to finish, including overcoming obstacles to intercourse (for both men and women,) enjoying a healthy pregnancy, and delivering a healthy baby. Nothing is quite so pleasant as walking into the hospital room of a mother with diabetes holding her healthy newborn. Pregnancy associated with diabetes used to be a disaster for both the baby and the mother. Fortunately, that is no longer the case. With the proper precautions, mothers with gestational diabetes can comfortably proceed through pregnancy safely as if they did not have the condition.

Treating and Reversing Common Male Complaints

If carefully questioned, up to 50 percent of all males with diabetes admit to having difficulty with sexual function. This difficulty usually takes the form of *erectile dysfunction* (ED), which is the inability to have or sustain an erection sufficient for intercourse. It develops 10 to 15 years earlier in men with diabetes than in men without diabetes. After the age of 70, more than 95 percent of men with diabetes have erectile dysfunction.

Good glucose control and focusing on lifestyle changes that maintain health means that ED is certainly not an inevitable result of living with diabetes. As we discuss in Chapter 4, the aim should always be to prevent complications or, where possible, reverse them if they occur.

Many factors besides diabetes can cause ED, and you should rule them out before blaming diabetes. After you eliminate the following possibilities for ED, you can feel confident that diabetes is the source of the problem:

- Trauma to the penis.
- Medications, such as certain antihypertensives and antidepressants.
- Hormonal abnormalities, such as insufficient production of the male hormone testosterone or overproduction of a hormone from the brain called *prolactin*. Note that sildenafil and the other three similar drugs in the "Treating for ED" section work even with low testosterone.
- Poor blood supply to the penis due to blockage of the artery by peripheral vascular disease (see Chapter 5), which can be treated very effectively by microvascular surgery.
- *Psychogenic impotence,* an inability to have an erection for psychological rather than physical reasons (a therapist can help manage this problem).

The body and mind are deeply connected. Problems with erections may well have both physical and psychological factors involved. If ED from any cause affects confidence and self-esteem, then it this in itself can create a vicious circle. Regaining sexual function following difficulties is a journey that needs support and understanding. The good news is that regaining function is entirely possible, especially with new approaches to treatment.

To understand how diabetes affects an erection, you need to first understand how an erection is normally produced.

Reviewing the erection process

As a result of some form of stimulation — such as touch, sight, or sound — the brain activates nerves in the *parasympathetic nervous system,* which is part of the autonomic nervous system. These nerves cause muscles to relax so that blood flow into the penis greatly increases. As blood flow increases, the veins through which blood leaves the penis compress, and the penis becomes erect. An erect penis contains about 11 times as much blood as a flaccid penis. With sufficient stimulation, muscles contract, propelling semen through the *urethra* (the tube in the penis that normally carries urine from the bladder) to the outside of the body. The pleasant sensation that occurs along with the muscle contractions (*ejaculation*) is called *orgasm.*

Orgasm and ejaculation are the result of stimulation by the other side of the autonomic nervous system, the *sympathetic nervous system.* As the stimulation causes contraction of the muscles, it closes the muscle over the bladder so that urine doesn't normally accompany expulsion of semen and the semen doesn't go back into the bladder.

Diabetes can damage the parasympathetic nervous system so that the male can't get an erection sufficient for sexual intercourse. The sympathetic nervous system is spared, so ejaculation and orgasm can occur, but intercourse may be challenging for both partners because of the psychological consequence of not being able to sustain a firm erection.

For diabetes patients, ED is affected by the following factors:

- **Degree of control of the blood glucose:** Better control is associated with fewer problems.
- **Duration of the diabetes:** The longer you have diabetes, the more likely you're unable to have an erection.
- **Interaction with your partner:** A positive relationship is important.
- **Use of drugs, tobacco, or alcohol:** Each may prevent erections.
- **State of mind:** A positive frame of mind is associated with more successful erections.

Discussing ED with your doctor

Although sexual intercourse tends to be an embarrassing topic for many people, if you have diabetes and have a problem in this key area of life, you need to discuss it with your doctor. Some doctors find this topic just as embarrassing as some

patients. Any doctor who treats patients with diabetes should bring the topic up (no pun intended) in the first meeting and annually thereafter. If your doctor doesn't, you should broach the subject yourself.

Erectile dysfunction has been shown to predict coronary artery disease in men with type 2 diabetes. Men with diabetes and ED who had heart attacks were older and had higher blood pressure, higher total cholesterol, lower HDL cholesterol, and longer duration of diabetes. This fact makes it especially important to discuss the problem with your doctor. In men with ED, the occurrence of heart attacks has been reduced with the use of statins. ED can occur in people with diabetes because of effects on the autonomic nervous system, but as we discuss in Chapter 5, this is linked with damage to large and small blood vessels, which are necessary for establishing and maintaining an erection. The association of ED with heart disease is, therefore, no coincidence and underlines the importance of good glucose control and a holistic approach to lifestyle factors that maintain vascular health.

Treating for ED

Fortunately, for men with diabetes with ED, numerous approaches to treatment exist, beginning with drugs, continuing with external devices to create an erection, and ending with implantable devices that provide a very satisfactory erection. Treatment is successful in 90 percent or more of men, but only 5 percent ever discuss the problem with their doctors. The following sections discuss these treatment options. It's always important to discuss these treatments with your doctor.

Viagra and similar medications

Sildenafil (Viagra) has been specifically studied in males with diabetes and is successful in 70 percent of patients. Sildenafil was the first in a class of medications called phosphodiesterase type-5 inhibitors. They work by relaxing and widening the blood vessels in the penis.

Sildenafil doesn't seem to affect diabetic control, but it isn't free of side effects. Some men experience headaches, facial flushing, or indigestion, which generally decline with continued use of the drug. It has also been found to cause a temporary color tinge to a man's vision as well as increased sensitivity to light and blurred vision. These side effects also decline with continued use of the drug.

Sildenafil is taken no more than once a day, about an hour before sexual activity. While the starting dose is 50 mg for men, when diabetes is present, 100 mg is often required. The drug itself doesn't cause erections; an erection occurs only as a result of some kind of sexual stimulation. But it does prevent an erection from subsiding, so it lasts longer. The effects of sildenafil begin in 30 to 60 minutes and can last for 12 hours after taking it.

Pfizer, which makes Viagra, couldn't expect to have the playing field to itself for very long, given that the game is something most men want to play. Bayer Pharmaceuticals and GlaxoSmithKline brought vardenafil (Levitra) to the marketplace. Its characteristics are very similar to Viagra, but the starting dosage is 10 mg, which probably means men with diabetes may need a dose of 20 mg. Vardenafil is also marketed as Staxyn.

TIP

Fatty foods decrease the absorption of both sildenafil and vardenafil is decreased, resulting in decreased effectiveness, which isn't true for the next two drugs.

Eli Lilly and ICOS Corporation market tadalafil (Cialis), which works like sildenafil and vardenafil but stays active for 36 hours. In addition, its onset of action is 15 minutes, half the time of the competing drugs. Cialis has been nicknamed the "weekender pill" because it permits spontaneous sexual activity from Friday to Sunday. The starting dose for Cialis is 10 mg, but, again, men with diabetes may need to start at twice that amount. Some patients take 2.5 to 5.0 mg daily so spontaneous sexual activity is always possible. Tadalafil sometimes causes back and muscle pains.

In 2012, Vivus, Inc. introduced avanafil (Stendra), which has an onset of action of 15 to 30 minutes and stays active for up to six hours. The recommended dosage is 100 mg or up to 200 mg for diabetics.

WARNING

Some men — including those at risk of *hypotension* (low blood pressure) or someone who has recently had a heart attack or stroke — must not take any of these drugs. Men who have chest pain often take nitrate drugs, the most common of which is nitroglycerine. The combination of any of them and nitrates may cause a significant and possibly fatal drop in blood pressure. Great care must be taken if the patient is on one of the blood pressure drugs called *alpha blockers* for the same reason. Common alpha blockers are doxazosin (Cardura), prazosin (Minipress), and tamsulosin (Flomax). A very small number of cases have been reported of one-sided hearing loss in men who took any of the preceding alpha blockers.

Injection into the penis

The patient can use an injection to create an erection. It's called alprostadil (Caverject or Edex), a chemical that relaxes the blood vessels in the penis to allow more flow. Alprostadil doesn't require sexual stimulation to work.

The drug is injected about 30 minutes before intercourse and no more than once in 24 hours and three times per week. An injection gives a full erection lasting about an hour in 85 to 95 percent of men, except for those who have the most severe loss of blood flow to the penis.

Complications of injections are rare but include bruising, pain, and the formation of nodules at the injection site. A very rare complication is *priapism,* where the penis maintains its erection for many hours. If the erection lasts more than four hours, the patient must see his doctor to get an injection of a *vasoconstrictor,* a drug that squeezes down the arteries into the penis so that blood flow is interrupted.

Suppository in the penis

Alprostadil — the chemical that can be injected into the penis — also comes in a suppository form. The patient inserts a tube containing this small pill into the opening of the penis after urination. When the tube is fully in the opening, the man squeezes the top so that the pill exits the tube. This preparation, called Muse, comes in several different strengths so that patients can use a higher dose if the lower dose doesn't result in a satisfactory erection. It may safely be used twice in 24 hours. A few men experience pain with this procedure. Sexual stimulation is unnecessary to achieve an erection.

Vacuum-constriction devices

Vacuum-constriction tubes, which fit over the penis, create a closed space when pressed against the body. A pump draws out the air in the tube, and blood rushes into the penis to replace the air. When the penis is erect, a rubber band is placed around the base of the penis to keep the blood inside it. Sometimes pain and numbness of the penis occur. The rubber band may be kept on for up to 30 minutes.

Implanted penile prostheses

If the patient doesn't like the idea of injecting himself in his penis or using a vacuum device, and if pills don't work for him, a *prosthesis* (an artificial substitute) can be implanted in the penis to give an erection. Prostheses come in several varieties. A semi-rigid type produces a permanent erection, but some men don't like the inconvenience of a permanent erection. An inflatable prosthesis involves a pump in the scrotal sac that contains fluid. The pump can be squeezed to transfer the fluid into balloons in the penis to stiffen it. When not pumped up, the penis appears normally soft. In the past few years, the surgery to insert these prostheses has become very satisfactory.

Facing Female Sexual Problems

Sexual dysfunction in women isn't as visually obvious as it is in men. But as many as half of women with diabetes have problems with sexual function, and the problems can be just as difficult to handle as they are for men. The following problems are associated with diabetes:

- Dry mouth and dry vagina because of the high blood glucose
- Irregular menstrual function when the diabetes is out of control
- Yeast infections of the vagina that make intercourse unpleasant
- A feeling of being fat and unattractive because type 2 diabetes is usually associated with obesity
- Discomfort about discussing the problem with a partner or physician
- Loss of bladder control due to a neurogenic bladder (see Chapter 5)
- A reduction in estrogen secretion and associated vaginal thinning and dryness due to increasing age made worse by the diabetes

TIP

Menopause can cause several of the same difficulties as diabetes-related sexual dysfunction, particularly the dry vagina and irregular menstrual function. You must rule out menopause before assuming that diabetes is the source of the problem.

A female with long-standing diabetes may have several other problems that are specific to their sexual organs. These problems include

- **Reduced lubrication because of parasympathetic nerve involvement:** Lubrication serves to permit easier entry of the penis, but it also increases the sensitivity of the vagina to touch, thus increasing pleasant sensations.
- **Reduced blood flow because of diabetic blood vessel disease:** Some of the lubrication comes from fluid within the blood vessels.
- **Loss of skin sensation around the vaginal area:** This loss reduces pleasure.

Most women who have problems with lubrication, whether due to diabetes or menopause, treat themselves with over-the-counter lubricants. Seek confidential advice from your doctor or pharmacist if you're unsure which is the best for you.

Estrogen may be useful for menopausal women. It can be taken by mouth or placed in the dry vagina in suppository, cream, or pessary form.

TIP

When psychological or interpersonal issues exist, a discussion with a therapist and sex therapy with your partner are important steps to take to improve sexual pleasure satisfaction.

Striving for a Healthy Pregnancy

About 0.4 percent of pregnancies occur in women with preexisting diabetes, called *pregestational diabetes*, and an additional 9.2 percent develop diabetes sometime in the second half of the pregnancy, called *gestational diabetes*. Four million births occur in the United States annually, and diabetes affects 360,000 or more pregnancies each year. Half of women who have gestational diabetes ultimately develop diabetes.

ASK THE DOCTOR

If you have diabetes and want to become pregnant, you need to talk with an expert in pregnancy and diabetes before you conceive. In the following sections, we explain potential complications you may experience and some steps you should take to ensure the healthiest pregnancy possible.

Realizing the body's reaction to pregnancy

During pregnancy, hormones block insulin action. In a nondiabetic pregnancy, the woman's body makes enough insulin to overcome this effect, and her blood glucose stays normal.

Tip: A woman with type 1 diabetes can't make more insulin, and during pregnancy, she needs two or three times her usual dose to counteract the effect of her hormones (although in the early first trimester, her insulin needs may decrease). This increased need for insulin in a woman with type 1 diabetes usually begins in the second trimester and stabilizes in the last several weeks of the pregnancy; by the last one or two weeks, the mother-to-be may actually begin to have hypoglycemia. After the baby and the placenta are delivered, her insulin needs plummet immediately.

A woman with type 1 or type 2 diabetes may have some retinopathy (see Chapter 5) before she become pregnant. If the condition is severe, her eyes may deteriorate during the pregnancy. The deterioration probably results from rapid improvement of blood glucose control in a woman who has been poorly controlled previously. If glucose control is improved or if laser photocoagulation (see Chapter 5) is carried out before the pregnancy, this deterioration doesn't take place. After the baby is delivered, her eyes will return to their previous state.

REMEMBER

If you're thinking about becoming pregnant and you have diabetes-related eye disease, that condition must be stabilized before you try to conceive.

Kidney disease, or *nephropathy* (see Chapter 5), increases the danger of complications of pregnancy for both the mother and baby. Severe, permanent worsening of the nephropathy is unusual as a result of pregnancy, but a temporary decline in

kidney function in the mother may occur. The baby may have to be delivered early, which can cause complications, so protection of kidney function is very important.

Being proactive before and during pregnancy

You can take a number of steps both before and during the pregnancy to ensure a healthy baby and an uncomplicated pregnancy.

Getting your health in order

You can take action in advance to avoid potential problems by controlling your glucose before conception. (See Part 3 for more on how to manage your diabetes.) In addition, you need to monitor your diet after you become pregnant. Parents-to-be are motivated to do the very best for their developing child, so now is a great time to make those lifestyle changes to provide optimum health.

Following are some other key steps you should take to improve your chances of a problem-free pregnancy:

WARNING

- **Lose weight.** Obesity, which is prevalent in type 2 patients, puts a mom-to-be at greater risk for hypertension during pregnancy.
- **Quit smoking.** Children of mothers who smoke during pregnancy are at much greater risk of developing obesity and diabetes later in life, not to mention numerous other health problems.
- **Use insulin for glucose control.** If you have type 2 diabetes and are taking oral agents to lower your glucose, you may need to switch to insulin to control your glucose during pregnancy.
- **Control your blood pressure.** Elevated blood pressure before and during early pregnancy is associated with increased risk of gestational diabetes mellitus.
- **Avoid animal protein.** Stay clear of it, specifically red meat, before and during the pregnancy and increase your intake of vegetable protein, specifically nuts, to reduce the risk of gestational diabetes.

For more detailed information about what to do during pregnancy, see the section "Treating diabetes during pregnancy," later in this chapter.

Most diabetic pregnancies can go to term at 39 weeks. However, if the mother-to-be has hypertension or a previous history of delivery problems, her doctor may advocate earlier delivery.

Taking special precautions if you've had bariatric surgery

Many more adolescents and young women have bariatric surgery to treat diabetes. They become pregnant at twice the rate of the general population after the surgery. These young women need to take the following precautions:

- Wait a year or two after surgery to conceive so that the growing fetus isn't exposed to rapid weight loss in the mother.
- Be closely monitored for nutritional status and the fetus's growth (especially at the beginning of the pregnancy) if conception occurs earlier than a year or two after surgery.
- Consult with a nutritionist. Nutritional insufficiencies are common after bariatric surgery.
- If contraception is desired, use a method other than oral drugs because of malabsorption.
- Be tested for gestational diabetes. The surgery usually reduces the risk for high blood pressure, which makes any pregnancy more complicated, and the blood glucose often returns to normal. The usual tests can't be done in the patient with bariatric surgery because of the abnormal absorption. Monitoring the blood glucose at different times of day may be helpful (see Chapter 7).

Diagnosing gestational diabetes

The current consensus is to test all women for undiagnosed diabetes at the first prenatal visit and to screen all women for gestational diabetes because a small but significant number of patients with gestational diabetes will be missed if all women aren't screened.

If your glucose tolerance is normal in weeks 27 to 31 of the pregnancy, you don't need to do more screening. If you experienced gestational diabetes during a previous pregnancy, the screening test is done much earlier — as early as the 13th week. Other reasons for earlier screening are

- Previous delivery of a large baby
- Obesity
- Glucose in the urine
- Close family members with diabetes

The screening test is done between weeks 24 and 28 of the pregnancy by doing a glucose tolerance test. No preparation is necessary. You consume 50 grams of glucose, and a blood glucose level is obtained from a vein one hour later. If the glucose level is less than 140, it's considered normal. If it's greater than 140, a further test is done before making a diagnosis of gestational diabetes because many women who have a value greater than 140 don't necessarily have diabetes. A diagnosis of gestational diabetes is made if two or more of the samples exceed these levels:

- Before consuming glucose: 95 mg/dl (5.3 mmol/L)
- One hour after consuming glucose: 180mg/dl (10.0 mmol/L)
- Two hours after: 155 mg/dl (8.6 mmol/L)
- Three hours after: 140 mg/dl (7.8 mmol/L)

Recognizing risks to mother and baby

Whether you have diabetes before pregnancy or develop gestational diabetes, you face many considerations regarding your own health and the health of your baby.

Persistently high blood glucose left untreated has major consequences for both mother and fetus. If high glucose is present early in the pregnancy, the result may be miscarriage or *congenital malformations* (physical abnormalities that may be life threatening) in the fetus. In the third trimester, the growing fetus may exhibit *macrosomia* (abnormal largeness) that can lead to an early delivery or damage to the baby or mother during delivery. Neonatal hypoglycemia and stillbirth are also risks of high glucose.

MEASURING THE RISKS

The hemoglobin A1C (see Chapter 7) is an excellent measurement of overall glucose control and provides a good indicator for the risk of miscarriage. If a pregnant woman's hemoglobin A1C is high, it indicates that she was in poor glucose control at conception, and the likelihood of a miscarriage is greater. If overall glucose control is normal, the baby of the woman with diabetes is no more likely to be miscarried than that of a woman without diabetes.

The situation for congenital malformations is a little more complicated. The occurrence of these malformations rises with increasing glucose, but the level of *ketones* (the breakdown product of fats) also impacts their occurrence. However, measuring the ketones doesn't tell you if malformations will definitely occur.

Babies develop normally if their fathers have diabetes but their mothers don't have diabetes. The environment in which the fetus is developing is responsible for the potential abnormalities. Elevated blood glucose, abnormalities of proteins and fats that result from the elevated glucose, and the loss of sensitivity to insulin explain the problems.

Early pregnancy problems

Miscarriages and congenital malformations can result from poor glucose control at conception and shortly thereafter. Both high blood glucose and low blood glucose can induce malformations. (For more on managing diabetes, see Part 3.)

However, a woman in poor control of her diabetes has more trouble conceiving a baby than a woman with good glucose control, which may be the major reason that more babies aren't born with congenital malformations.

REMEMBER

Unlike diabetes that occurs before pregnancy, gestational diabetes mellitus doesn't cause congenital malformations. In gestational diabetes, blood glucose doesn't start to rise until halfway through the pregnancy, long after the baby's important body structures are formed.

Late pregnancy problems

Babies born to mothers with diabetes may be a larger size at birth. A baby is considered large if it weighs more than 8.8 pounds at birth. Keep in mind that most large babies are the healthy offspring of mothers without diabetes. Their growth is proportional throughout the pregnancy, so their shoulders aren't out of proportion to their heads and delivery isn't complicated.

WHY MACROSOMIA OCCURS

Macrosomia, or abnormal largeness in a fetus, has to do with the elevated glucose, fat, and amino acid levels in the second half of pregnancy for a mother with diabetes. If these levels aren't lowered, the fetus is exposed to high levels. The high levels, especially of glucose, stimulate the fetal pancreas to begin to make insulin earlier and to store these extra nutrients. The fetus becomes large wherever fat is stored, such as in the shoulders, chest, abdomen, arms, and legs. Because they are large, macrosomic babies are delivered early in order to make the delivery easier and avoid birth trauma. However, though they are large, they're not fully mature.

However, women with pregestational diabetes or gestational diabetes need to be concerned about having a baby whose largeness isn't proportional. The areas that are most responsive to insulin, where fat is stored in the baby, are the ones that enlarge the most. (See the sidebar "Why macrosomia occurs" for more information.)

Treating diabetes during pregnancy

You need to achieve a stricter level of glucose control during pregnancy than when you aren't pregnant. Your fetus is removing glucose from you at a rapid rate, so your blood glucose level is lower than usual. In addition, your body turns to fat for fuel much sooner, so you produce ketones earlier. Too many ketones can damage the fetus as well. The fact that you break down fat so early is termed *accelerated starvation.*

Monitoring your glucose and ketones

To maintain proper blood glucose levels, you must measure it more frequently. You should measure it before meals, at bedtime, and occasionally one hour after eating. Your goal is to achieve the following levels of blood glucose:

TIP

- **Fasting and premeal:** Less than 90 mg/dl (5 mmol/L)
- **One hour after eating:** Less than 140 mg/dl (7.7 mmol/L)
- **Two hours after eating:** Less than 120 mg/dl (6.7 mmol/L)

TIP

Recent studies have shown that the glucose level one hour after eating may be the most important for pregnant women with diabetes to keep under control.

You also need to check for ketones in the urine before breakfast and before supper. You can do so by placing a test strip in the stream of urine. The strip indicates whether ketones are present. If the test strip is positive, it means that you're not eating enough carbohydrates and your body is going into accelerated starvation. Too much of this condition isn't good for the growing fetus.

Eating well

Your appropriate amount of weight gain depends on your weight and body mass index at the time you become pregnant. (See Chapter 3 if you're not sure how to calculate your BMI). If your BMI is normal, you should gain 20 to 25 pounds during the pregnancy. However, if you're overweight, you need to gain less weight through the pregnancy, 15 to 20 pounds. If you're obese, you should gain no more than 17 or 18 pounds. And if you're underweight, you should gain 25 to 30 pounds.

TIP

Chapter 8 tells you what you need to know about diet and diabetes. We explore some of the limitations of calorie counting and BMI as indictors of a good diet and health. When talking about carbohydrates, proteins, and fats, it's always important to remember that the *quality* and types of macronutrients are most important and good foods should be considered for more than just their macronutrients. As a pregnant woman with diabetes, you may receive the following advice, which does have some merit:

- Your daily food intake should be 35 to 38 kilocalories per kilogram of ideal body weight. (In this book, we use the term *kilocalories* rather than *calories,* which is typically used incorrectly.) You can use your height to determine your ideal body weight (IBW). A 5-foot woman should weigh 100 pounds; add 5 pounds for every inch over 5 feet. For example, a 5-foot 4-inch woman should weigh 120 pounds, ideally (and *approximately,* because these numbers represent a range, not a single weight). You can change that figure to kilograms by dividing the pounds by 2.2. Then multiply that number by 35 to get the low end of the daily calorie intake and by 38 to get the high end. So if you weigh 120 pounds, you weigh 54.6 kilograms and your daily food intake should be between 1,900 and 2,100 kilocalories.
- Your protein intake should be about 20 percent of your daily kilocalories, or 1.5 to 2 grams per kilogram of IBW. A woman with the IBW of 54.6 should eat about 100 grams of protein daily. Because each gram of protein contains four kilocalories, protein takes up about 400 of the 2,000 daily kilocalories.
- Your carbohydrate intake should be 50 to 55 percent of your daily kilocalories. If you need approximately 2,000 daily kilocalories, about 1,000 kilocalories should be carbohydrate. Because each gram of carbohydrate has 4 kilocalories, just like protein, this amounts to 250 grams of carbohydrate.
- Your fat intake should be less than 30 percent of the total daily kilocalories. Using 2,000 kilocalories as our target, that amounts to 630 kilocalories of fat. Because fat contains 9 kilocalories per gram, this equals 70 grams of fat a day.
- You need to eat three meals a day plus a bedtime snack. Frequently eating helps prevent the accelerated starvation that results from the prolonged fast between supper and breakfast.
- You must maintain fasting and premeal glucose levels below 90 mg/dl.

Your glucose should be less than 140 mg/dl one hour after meals. Ask your doctor to send you to a dietician to develop a meal plan.

In addition, you can use a good prenatal multivitamin and mineral preparation. Folic acid is of particular importance, and supplements are recommended especially in early pregnancy to reduce the risk of nervous system abnormalities.

A moderate amount of exercise is also very helpful in controlling the blood glucose and keeping you in top shape during pregnancy.

Testing for fetal defects

A blood test called a *serum alpha-fetoprotein* can be done 15 weeks into the pregnancy to determine whether the fetus has neural tube defects (openings in the brain or spinal cord more common when conception occurs in a poorly controlled diabetic). At 18 weeks, an ultrasound can show any malformations of the growing fetus. An ultrasound, by directing a sound at the fetus and catching it as it bounces back to the machine, produces a picture of the fetus that shows the presence of any abnormalities. This harmless test isn't painful for the mother or the fetus.

Another useful study during the diabetic pregnancy is the nonstress test. A device is placed on your abdomen that listens to the fetus's heartbeat. When the fetus moves, its heart rate normally speeds up by 15 to 20 beats per minute. This increase in heart rate should normally occur at least three times in a 20-minute period of listening.

Handling issues of gestational diabetes

If you have gestational diabetes, you don't need to worry specifically about congenital malformations in your baby, but you need to avoid macrosomia. You need to follow the same dietary prescription as the woman with pregestational diabetes, and you need to use insulin if a careful diet doesn't keep your fasting blood glucose below 90, your glucose one hour after eating below 140,or your glucose two hours after eating below 120. Your insulin regimen will probably be simpler than that of women with pregestational diabetes because your pancreas can make its own insulin. Routine ultrasound scanning will be done during pregnancy, but additional care will be taken to look at the size of your baby toward the end of pregnancy. If macrosomia is present, your doctor may suggest they perform a cesarean section, removing the baby through an incision made in the abdominal wall and then in the uterus.

Delivering the baby

Delivering a baby at the end of 39 weeks is best because full-term pregnancy gives the baby time to mature completely. The same is true if the mother has diabetes. If the mother doesn't go into labor spontaneously, the physician usually induces labor. The uterine contractions of pregnant women with diabetes aren't as strong as those of pregnant women without diabetes. This difference may explain the increase in rates of C-sections for these women.

If you have been taking insulin during pregnancy, nurses will monitor your blood glucose every four hours after you deliver. Your blood glucose will be maintained at 70 to 120 mg/dl with insulin, if necessary. The insulin is given in short-acting form as needed and not in large doses of long-acting insulin, which would be in your system when you no longer need it.

Maintaining your health after pregnancy

There are many advantages to breastfeeding that you should discuss with your health care provider. In these cases, mothers shouldn't feel a sense of failure. In addition to fostering healthy infants, breastfeeding helps you burn extra fat that you may have gained during your pregnancy. I you choose to breastfeed your baby, you need to consume about 300 kilocalories *above* your usual needs. You can't take oral agents for diabetes because they pass through the milk into the baby. For more information about breastfeeding, see "Diabetes and Breastfeeding" at `www.diabetes.org`.

REMEMBER

It is a healthy choice to breastfeed babies in general, however, in some circumstances it may not be possible.

WARNING

Gestational diabetes usually disappears when the pregnancy is over. However, a woman who develops gestational diabetes during pregnancy is at a much higher risk for developing diabetes later in life. If your fasting blood glucose is greater than 130 during pregnancy, the risk of developing diabetes again is as much as 75 to 90 percent in the next 10 to 15 years. Even modestly elevated blood glucose levels during a pregnancy that don't rise to the criteria for gestational diabetes are associated with a higher risk for future type 2 diabetes. You're also at much higher risk of heart disease, mainly due to the development of diabetes.

Women who don't breastfeed have a 50 percent increased risk of type 2 diabetes compared to women who never give birth. Women with gestational diabetes who breastfeed lower their risk of later diabetes.

If you had gestational diabetes, you need to have a test for glucose tolerance between 6 and 12 weeks after the pregnancy and annually after that if diabetes isn't found.

Several factors predispose women with gestational diabetes to develop diabetes later on. Following are some factors that can't be changed:

- **Ethnic origin:** People of certain ethnic heritage, such as Latin, Native American, Asian, and African-American, are at a higher risk.

- **Prepregnancy weight:** Women with a higher prepregnancy weight are at a higher risk.
- **Number of pregnancies:** The more pregnancies you have, the higher your risk.
- **Family history of diabetes:** If a family history is present, you're at a higher risk.
- **Severity of blood glucose during pregnancy:** Higher blood glucose levels mean a higher risk.

On the other hand, you can reduce several risk factors:

- **Future weight gain:** Gain less weight in future pregnancies.
- **Future pregnancies:** Have fewer children.
- **Physical activity:** Increase your exercise.
- **Diet:** Improve all aspects of your diet.
- **Smoking and certain drugs:** Stop smoking and using drugs.

Using the drug metformin (see Chapter 11) can also help prevent future diabetes.

Women who have had gestational diabetes can use oral contraceptives with low levels of estrogen and progesterone to prevent conception. These drugs, along with hormonal replacement therapy after menopause, don't increase your risk of later diabetes. They may, in fact, decrease the risk and decrease blood glucose levels in those who have diabetes already. Women with type 1 and type 2 diabetes can use the same preparations.

Focusing on your baby's health

Increased understanding of diabetes's impact during pregnancy has resulted in a great reduction in malformations in these babies as well as the macrosomia that leads to complications at delivery. Unfortunately, many women with diabetes don't have tight glucose control at conception, so some malformations still occur. If an obvious malformation is present at birth, searching for other malformations is important.

Keep in mind that the fetus was producing a lot of insulin to handle all the maternal glucose entering through the placenta. Suddenly, maternal glucose is cut off at delivery, but the high level of fetal insulin continues for a while. The danger of hypoglycemia exists in the first four to six hours after delivery. The baby may be sweaty and appear nervous or even have a seizure. It is necessary to do blood

glucose tests on the baby hourly until they're stable and to continue testing at intervals for the first 24 hours. The health team looking after you after delivery will need to closely monitor you and your baby.

Besides hypoglycemia, the baby may have several other complications right after birth:

- **Respiratory distress syndrome:** This breathing problem occurs when the baby is delivered early, but it responds to treatment. This condition is rare with good prenatal care.
- **Low calcium, with jitteriness and possible seizures:** Calcium needs to be given to the baby until its own body can take over. This condition is usually a result of prematurity.
- **Low magnesium:** This complication presents itself like low calcium and is also a result of prematurity.
- **Polycythemia:** This condition, where too many red blood cells exist, occurs for unknown reasons. Treatment requires removing blood from the baby. The amount is determined by how much extra blood is present.
- **Hyperbilirubinemia:** This condition is the product of too much breakdown of red blood cells. It's treated with light.
- **Lazy left colon:** Occurring for unknown reasons, this condition presents itself like an obstruction of the bowel but clears up on its own.

A baby exposed to high glucose and ketones during the pregnancy may show diminished intelligence. This effect isn't obvious at birth but is discovered later when the baby is slow to reach learning milestones. However, this is largely preventable and is very uncommon due to much better supervision and control of glucose during pregnancy.

Large babies of poorly controlled mothers with diabetes usually lose their fat by age 1. Starting at ages 6 to 8, however, these children have a greater tendency to be obese. Controlling the blood glucose in the mother may prevent later obesity and even diabetes in her offspring.

Dealing with Polycystic Ovarian Syndrome

Polycystic ovarian syndrome (PCOS) is responsible for abnormal menstrual function in 5 to 8 percent or more of women during their reproductive years. It tends to run in families. Women with this condition often have trouble conceiving a

child, and they have increased hair on their faces, arms, legs, and areas of the body that aren't usually hairy in women. In addition, they often experience acne and obesity. They also have more abnormal blood fats associated with coronary artery disease.

The surprise finding in PCOS is that these women are also resistant to insulin and have increased blood levels of insulin. The greater the degree of obesity, however, the more likely the metabolic syndrome (see Chapter 5). In fact, women with PCOS who do get pregnant have a prevalence of gestational diabetes that is two to three times that of those women without PCOS. They also have higher rates of other complications of pregnancy, including high blood pressure, preeclampsia, preterm delivery, and small babies.

Women with PCOS who are normal in weight don't have insulin resistance or a greater tendency to develop type 2 diabetes.

Brothers of women with PCOS who have insulin resistance also have insulin resistance, suggesting that a strong component of inheritance is present.

Another feature that women with PCOS have in common with metabolic syndrome is obstructive sleep apnea. This sleep apnea results in daytime sleepiness and high blood pressure. PCOS patients with obstructive sleep apnea tend to have insulin resistance and type 2 diabetes more often than those without.

The name of the syndrome derives from the fact that early cases of PCOS were associated with multiple ovarian cysts. More recently, the presence of ovarian cysts hasn't been a prominent feature of the condition, but the name has stuck.

Women with PCOS have increased levels of male-associated hormones called *androgens.* Studies have shown that androgens cause decreased insulin sensitivity when they're given to women who don't have PCOS.

WARNING

The major health risks for someone with PCOS, besides infertility, are the occurrence of impaired glucose tolerance and type 2 diabetes, as well as gestational diabetes. In addition, just like patients with metabolic syndrome (see Chapter 5), these women are at greater risk for high blood pressure, abnormal blood fats, and cardiovascular disease. A group of women who had PCOS and were followed for 18 years were found to have twice the risk of diabetes compared to those without PCOS.

The most effective treatment for PCOS is lifestyle change. Weight loss and exercise often reverse the condition and prevent the development of diabetes. In very obese women with PCOS, weight-loss surgery can reverse PCOS. Oral contraceptives

have been used in the past when more treatment is needed, but they don't restore fertility, which is often the main purpose of treatment. They can still be used to control the other symptoms, such as acne, irregular menses, and increased hair. Insulin sensitizing drugs, including metformin, have been very effective for treating all features of the syndrome.

TIP

Other than oral contraceptives, any treatment that is successful for reducing the acne, hairiness, and decreased insulin sensitivity in PCOS also makes the woman much more likely to get pregnant. If she doesn't want to become pregnant, she and her partner need to take the necessary precautions.

3 Living Your Best Life: The "Thriving with Diabetes" Lifestyle Plan

IN THIS PART . . .

Get all the right tests and test your own glucose so you can discover how your food, exercise, and medications affect your blood glucose.

Discover that you can eat food that helps control diabetes without giving up great taste.

Consider nourishing your mind and spirit as well as your body to obtain optimal health.

Understand options to address your diabetes with surgery — a tool that could save you years of medical treatments and a lot of money.

Create and learn to enjoy your exercise plan. Witness how even without weight loss, exercise can prevent turning prediabetes into diabetes and help control diabetes if it develops.

Find easy and practical ways to plan meals, shop for food, and organize your kitchen to make cooking easy, fun, and accessible on a daily basis.

Take the right medications at the right times and in the right amounts to maximize their ability to lower your blood glucose.

Create a diabetes team made up of experts as well as family members, all of whom are dedicated to your good health.

IN THIS CHAPTER

- Checking glucose with meters and A1C
- Testing for kidney damage
- Examining your eyes and feet
- Finding your level of cholesterol and other fats
- Gauging your blood pressure, weight, and other details

Chapter 7

Self-Testing for Glucose and Other Key Tests

The key to remaining well and preventing complications of diabetes is through control of blood glucose levels and maintaining a healthy lifestyle to help reduce other risk factors for vascular diseases. This chapter describes the ways to measure blood glucose either directly or indirectly so that you can closely monitor your diabetes and see tangible evidence of lifestyle and treatment improvements reflected in better "numbers," as well as feeling better in yourself.

The HbA1C test that we describe in Chapter 2 reflects the amount of circulating glucose over a period of several weeks. For many people with type 2 diabetes, this is the most useful test to provide information about progress toward better long-term glucose control and even remission from diabetes. In type 2 diabetes, blood glucose levels are higher than normal, but some insulin still produces a response to eating, exercise, and other factors, despite insulin resistance. Also, unless it's so severe as to require medications that directly lower blood glucose, including insulin, extremely high or low levels of blood glucose aren't common and sudden fluctuations are unusual.

The purpose of monitoring is to reduce the risk of long-term complications from higher circulating glucose rather than to prevent short-term complications. Short-term complications are less of a concern for most people with type 2 diabetes whose condition may be controlled by lifestyle measures or simple medications that don't cause sudden changes in glucose levels.

Measuring blood glucose levels on a regular basis is something that's necessary for people with type 1 diabetes. Rising blood glucose without the insulin to control it, or where levels fall following administration of insulin, can result in dangers of sudden hyperglycemia or hypoglycemia. If insulin resistance is very advanced in type 2 diabetes and insulin replacement is needed, it can also be important to measure blood glucose frequently or even continuously to prevent hypoglycemia from the powerful and direct effects of insulin treatment.

In addition to measuring the progress of your diabetes using HbA1C and monitoring blood glucose to prevent short-term complications, it's important to test for signs of possible long-term complications, which we discuss in Chapter 5. In this chapter, we talk about some of these tests that you may regularly take as part of the treatment plan you and your doctor agree to follow.

Tracking Your Glucose over Time: Hemoglobin A1C

To follow your improvement with treatment, you need a test that gives you the big picture: the average blood glucose over time. Figure 7-1 shows the correlation between the hemoglobin A1C and the estimated average blood glucose.

As you can see in the figure, a normal hemoglobin A1C of less than 6 percent (42 mmol/mol being the equivalent measurement used in Europe) corresponds to an estimated average blood glucose of less than 126, while a fair hemoglobin A1C of 7 percent (53mmol/mol) reflects an average blood glucose of 155. Prediabetes is defined as having a hemoglobin A1C of between 6 percent (42 mmol/mol) and the threshold for diagnosis of diabetes at 6.5 percent (48 mmol/mol).

Large-scale studies have shown that the average hemoglobin A1C in the United States for type 2 diabetes is around 9.4 percent (79mmol/mol), which means the average blood glucose is 223. The American Diabetes Association recommends taking action to control the blood glucose if the hemoglobin A1C is 8 percent (64mmol/mol) or greater, with the goal being less than 7 percent (53mmol/mol).

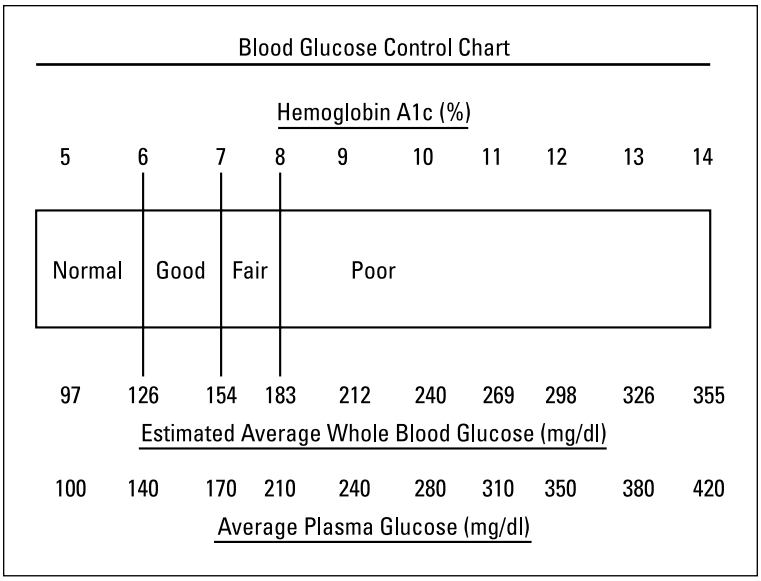
Blood Glucose Control Chart
Hemoglobin A1c (%)
5 6 7 8 9 10 11 12 13 14
Normal
Good
Fair
Poor
97 126 154 183 212 240 269 298 326 355
Estimated Average Whole Blood Glucose (mg/dl)
100 140 170 210 240 280 310 350 380 420
Average Plasma Glucose (mg/dl)

FIGURE 7-1: Comparison between hemoglobin A1C and blood glucose.

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The American Association of Clinical Endocrinologists suggests a goal of 6.5 percent or less; however, your agreed target needs to be a decision you make with your doctor based on your particular circumstances. Your doctor may suggest relaxing targets if the likely benefits of tighter control don't outweigh the risks of side effects.

TIP

It's now possible to do a hemoglobin A1C test at home or with your doctor. You do a finger stick to produce a large drop of blood. Then you mix the blood with a solution that's provided and place a sample of that mixture in the testing device. Five minutes later, the hemoglobin A1C result appears in the device window. You then discard the device. Because it's so quick, your doctor can have the test results while you're at their office or via email and can act on them immediately, instead of waiting for a lab to return the test results at a later time.

Another option is to collect your own blood specimen and send it to a company that runs the test and gives you and your doctor a result. However, in most countries, doctors will still order the blood test from their clinic and discuss the result with you when it's available.

TIP

The Diabetes Control and Complications Trials have shown that maintaining a hemoglobin A1C of 7 percent or less for several years early in type 1 diabetes results in diabetes complications 50 percent or lower 20 years later, even when the A1C is higher after those years.

TIP

Low thyroid function falsely raises the hemoglobin A1C. An A1C between 5.7 and 6.4 percent is an indicator of prediabetes.

Monitoring Blood Glucose

Monitoring blood glucose on a regular or continuous basis is essential for people with type 1 diabetes where insulin treatment is required to replace and mimic as precisely as possible the body's response to changes in blood glucose. Too little insulin for any given circumstance risks hyperglycemia, and too much can result in precipitous falls in blood glucose resulting in hypoglycemia.

In contrast, the majority of people with type 2 diabetes will use the HbA1C for monitoring their diabetes because it's treated by diet or a medication regimen, which is designed to improve the efficiency and support the compromised insulin response rather than replace it entirely. This means that dramatic fluctuations in blood glucose levels, including hypoglycemia, are much less likely, and it's usually not necessary to know exact blood glucose levels at any one point in time. However, it can be helpful to understand how your blood glucose is altering to understand those factors that might be most important for you.

The exception to this, as we discuss in Chapter 12, is with more advanced type 2 diabetes. In some circumstances, long-term control and protection from complications can be achieved only through adding medications, including insulin, which much more powerfully reduce blood glucose. If the HbA1C isn't reducing to target levels with the use of first- or second-line medications, then insulin may be considered. Essential in type 1 diabetes, insulin becomes a treatment of choice when the risks of complications of poorly controlled type 2 diabetes are greater than the dangers of its power to result in unwanted hypoglycemia.

What are the testing methods?

Before the widespread acceptance of the use of the HbA1C as a diagnostic test for diabetes, with thresholds established for prediabetes and diabetes, a random or fasting glucose blood test was routinely used, followed by a more accurate glucose tolerance test. A blood test from a vein taken by a health professional is called a *venous blood sample.* Checking blood glucose intermittently at home with kits using a pin prick test or *capillary blood sample* has become more commonplace. Self-monitoring of blood glucose is sometimes referred to by the acronym SMBG.

However, one of the first things that was learned when frequent testing of blood glucose became feasible is that a person with diabetes, even a person who works hard to control their glucose, can experience tremendous variation in glucose levels in a relatively short time, as little as 30 minutes. This variation is especially true in association with food, but it can occur even in the fasting state before breakfast. For this reason, multiple tests are needed.

A single capillary blood glucose level by a finger prick remains important if hypo- or hyperglycemia are suspected and for understanding the effect of insulin doses and other glucose-lowering medications, especially if you're at risk of hypoglycemia while driving or operating machinery. Measuring blood glucose for tighter control during periods of illness, during a period of a change in medications that can alter glucose levels, or during pregnancy may also be advised. It's less useful for monitoring long-term control of diabetes.

In recent years, technological advances have made it possible to use devices that measure blood glucose in the fluid under your skin by wearable remote sensor rather than a blood test. Although the result may lag a little behind circulating levels, the device allows the wearer to do a check at any time. One type of system is called intermittently scanned continuous glucose monitoring (isCGM, commonly also referred to as *flash* monitoring). The sensor sends information to a receiver or cell phone every few minutes, and the information can be picked up when scanned. Another device can provide information more immediately at the touch of a button, share data, and integrate with an insulin administration pump, which provides the possibility of a *closed loop system* where adjustments are made to insulin delivery in response to feedback from the sensor. This is called real-time continuous glucose monitoring or rtCGM.

TIP

Continuous glucose monitoring, especially for those with type 1 diabetes allows for monitoring the real-time effect of lifestyle and diet on glucose levels. It can lead to real and sustainable change and help with motivation. It helps to have a nutrition professional help interpret what you see, at least at first.

The decision to test using the HbA1C every three months, to regularly use finger prick blood glucose tests, or to wear a sensor for continuous glucose monitoring depends on your diabetes control and how likely treatments are to cause sudden changes in your blood glucose. You and your doctor will be able to choose which is the best way to keep your diabetes well controlled. In some countries, this may be entirely at the discretion of the patient and doctor; in others, this may be predetermined by affordability or by limits of insurance coverage. It's best to use the system for testing and measuring blood glucose that you and your doctor find straightforward and most helpful.

How often should you test?

How often you test is determined by the kind of diabetes you have, the kind of treatment you're using, and the level of stability of your blood glucose:

- If you have type 1 or type 2 diabetes and you're taking before-meal insulin, you need to test before each meal and at bedtime. The reason for this frequent testing is that you're constantly using this information to make adjustments in your insulin dose. No matter how good you think your control is, you can't feel the level of the blood glucose without testing unless you're hypoglycemic.

  TIP

  People with type 1 diabetes should occasionally test one or two hours after a meal and in the middle of the night to see just how high their glucose goes after eating and whether it drops too low in the middle of the night. These results guide you and your physician to make the changes you need.

  Numerous studies have shown that increased daily frequency of blood glucose testing is significantly associated with lower levels of hemoglobin A1C and fewer complications of diabetes in patients who take insulin. There is a 0.2 percent lowering of A1C for each extra test, up to a maximum of five tests.

- If you have type 2 diabetes and managing with pills or just diet and exercise, testing doesn't seem to make a major difference in your glucose control. In a large study, regular testing resulted in just a 0.25 percent reduction in hemoglobin A1C, and even this improvement was gone by 12 months. The main reason is that patients don't use the test results to make changes in treatment.
- If you're pregnant, see the testing guidelines we outline in Chapter 6.

TIP

The blood glucose test can be useful many other times of day in the patient on insulin:

- If you eat something off your diet and want to test its effect on your glucose, do a test.
- If you're about to exercise, a blood glucose test can tell you whether you need to eat before starting the exercise or if you can use the exercise to bring your glucose down.
- If your diabetes is temporarily unstable and you're about to drive, you may want to test before getting into the car to make sure that you're not on the verge of hypoglycemia. Even if your diabetes is stable, testing at the beginning and after every couple of hours of a long drive can prevent serious hypoglycemia.

How do you use a lancet?

To get the drop of blood you need to perform a glucose test, you have to use a spring-loaded device that contains a sharp lancet. You push the button of the device, and the lancet springs out and pokes your finger. Devices that allow different depths of penetration are useful for small children.

Although you don't have to use alcohol on your fingers, they should be reasonably clean. Use the side of your finger to avoid the more sensitive tips that you don't want to hurt, especially if you use a keyboard frequently. Change fingers often so that no finger becomes very sensitive.

Remember never to use a used lancet on someone else. Each lancet lasts for a few pokes and should then be discarded in a special sharps container so it can't poke someone else accidentally. Discuss with your healthcare professional and pharmacist on the local arrangements for safe disposal of used lancets.

TIP

Make sure you wash and dry your hands if you peel fruit just before testing yourself. Glucose in the peel can significantly modify the result.

How do you perform the test?

If you don't already own a blood glucose meter, be sure to check out the next section. All meters require a drop of blood, usually from the finger. (See the previous section, "How do you use a lancet?") You place the blood on a specific part of a test strip and allow enough time, usually between five seconds and one minute, for a reaction to occur. Some strips allow you to add more blood within 30 seconds if the quantity is insufficient. The need for a second stick of your finger is rare if you use a test strip that requires less blood. In less than a minute, the meter reads the product of that reaction, which is determined by the amount of glucose in the blood sample.

TIP

Keep the following tips in mind when you're testing your glucose:

- **If you have trouble getting blood, you can wrap a rubber band around the point where your finger joins your hand.** You will be amazed at the flow of blood. Take off the rubber band before a major hemorrhage occurs (just joking).
- **Testing blood from sites other than your fingers is generally reliable, except for an hour after eating, immediately after exercise, or if your blood glucose is low.** These other sites don't reflect the rapid changes in blood glucose that are occurring.

- **Some meters use whole blood, and some use the liquid part of the blood, called the *plasma*.** A lab glucose tests the plasma. The whole blood value is about 12 percent less than the plasma value, so you need to know which you're measuring. The various recommendations for appropriate levels of glucose are plasma values unless specifically stated otherwise. Most of the newer meters are calibrated to give a plasma reading, but check yours to be sure.
- **Studies have shown that the quality of test strips, which are loose in a vial, deteriorate rapidly if the vial is left open.** Be sure to cap the vial. Two hours of exposure to air may ruin the strips. Strips that are individually foil-wrapped don't have this problem.
- **Check the expiration date of the strips.** Expired strips won't give correct results.
- **Don't let other people use your meter.** Their test results will be mixed in with your tests when they're downloaded into a computer. In addition, a meter invariably gets a little blood on it and can be a source of infection.

Which blood glucose meter should you choose?

There are numerous machines with their corresponding test strips available in different countries — too many to describe individually in this book. They vary in size, price, and the way in which they interface with computer or smartphone technology for data transfer, analysis, and reporting. Some may integrate the recording of your insulin dose, and others may provide a reminder of when to test. For those people at risk of ketoacidosis (see Chapter 4), some machines also measure blood ketone levels. Each manufacturer promotes perceived advantages of their product, including the added advantage of mobile phone compatibility, but ultimately the decision on which system to use is best made between you and your healthcare team.

TIP

Because the meters are so inexpensive and the science changes so rapidly, you should get a new meter every year or two to make sure that you have state-of-the-art equipment. The cost of test strips is generally about the same from meter to meter.

All the various machines are accurate to a degree acceptable for managing your diabetes. Keep in mind, though, that they don't have the accuracy of a laboratory. Meters are probably about plus or minus 10 percent compared to the lab.

Your doctor may have a preferred meter because a computer program can download the test results from the meter and display them in a certain way. This

analysis can be enormously helpful in deciding how to alter your therapy for the best control of your glucose.

TIP

Any meter you buy should have a memory that records the time and date so you can read that information along with the glucose result. The memory should hold at least 100 glucose values. If you test four times a day, you have 25 days' worth of readings.

WARNING

Don't buy a meter without the capability to download the results to a data-management system in a computer. Bring your meter with you to your appointments so that your doctor or an assistant can download your glucose test results and evaluate them with the aid of a data-management system. Evaluating pages of glucose readings in a log book is virtually impossible.

Your insurance company also may mandate a certain meter, in which case, you may have no choice.

TIP

Ask yourself the following questions when choosing a meter:

- If a small child is to use it, can the child easily use the meter and strips?
- Are the batteries common ones, or are they hard to get and expensive?
- Does the meter have a memory that my doctor and I can check?
- Is the meter downloadable to a computer program that can manipulate the data?
- Do I have to calibrate the meter every time I change to a new box of strips (an inconvenient step)?

Testing for Kidney Damage: Moderately Increased Albumin (MIA)

The finding of very small but abnormal amounts of protein in the urine, called moderately increased albumin (MIA; formerly microalbuminuria), is the earliest sign that high glucose may be damaging your kidneys (see Chapter 5). When MIA is found, you still have time to reverse any damage.

As soon as you're diagnosed with type 2 diabetes, and within five years of being diagnosed with type 1, your doctor must order a urine test for MIA. If the test is negative, it must be repeated annually. If the test is positive, it should be done a

second time to verify the result. If the second test is positive, your doctor should do the following:

- **Put you on a drug called an ACE inhibitor.** After you've been on this drug for some months, the test for MIA can be repeated to see whether it has turned negative. The ACE inhibitor can be stopped and restarted later if MIA appears again. If ACE inhibitors aren't tolerated, then ARBs, another class of antihypertensives, may be used. Both classes have been shown to reverse MIA and the ongoing kidney damage it reflects.
- **Bring your blood glucose under the tightest control possible.** Bringing it under control helps to reverse the damaging process as well.
- **Normalize your body fats so that your cholesterol and triglycerides are made normal.** Elevated cholesterol and triglycerides have been found to damage the kidneys. (See the section "Tracking Cholesterol and Other Fats," later in this chapter.)
- **Bring your blood pressure under control.** Lowering your blood pressure will help to minimize the damage to your kidneys that occurs when they're exposed to elevated blood pressure.

TIP

Up to 25 percent of patients with diabetes can have ongoing kidney damage without showing an elevated microalbumin. For this reason, the idea that all patients with diabetes should receive an ACE inhibitor or an angiotensin II reception blocker (ARB, a similar class of medication) may not be far-fetched.

TIP

Women who have gestational diabetes and show MIA have been found to have heart disease and kidney disease later, even if they don't develop diabetes. Persistent MIA predicts later heart disease even in the absence of gestational diabetes.

Checking for Eye Problems

All people with diabetes need to have a dilated eye exam done annually (or every two years if no eye disease is present) by an ophthalmologist or optometrist.

For this exam, the doctor instills drops into your eyes and uses various instruments to examine the pressure, the appearance of your lens, and, most importantly, the retina of your eye.

All kinds of treatments can be done if abnormalities are found, but they must be discovered first. (See Chapter 5 for more information on eye problems.)

TIP

This test is something you must make sure you have done. Your doctor must refer you to an ophthalmologist or optometrist every year. Better yet, set up the appointment yourself with the eye doctor's nurse at the end of your first visit so that you're reminded about it each year. People who have mild type 2 diabetes and no retinopathy may be tested at two-year intervals rather than annually.

Examining Your Feet

Failing to take care of your feet can lead to serious consequences, including amputation. An amputation is really evidence of inadequate care. (For more on foot problems, see Chapter 5.)

TIP

If you have any problem sensing touch with your feet, you need to take the following precautions:

- You must use your eyes to examine your feet every day.
- You must use your hand to test hot water before you step into it so that you don't get burned.
- You must shake out your shoes before you step into them to make sure no stone or other object is inside them.
- You must not go barefoot.
- You must keep the skin of your feet moist by soaking them in water, drying them with a towel, and applying a moisturizing lotion. (Soaking should always be accompanied by drying and moisturizing.)

Your doctor can test your ability to feel an injury by using a 10-gram filament, but, again, that is done only when you have an appointment. You can obtain one of these filaments for yourself. A couple of the places where you can get them include

- Lower Extremity Amputation Prevention (LEAP) Program: `www.hrsa.gov/hansens-disease/leap`
- Medical Monofilament Manufacturing, LLC: `https://medicalmonofilament.com/`, or call 508-746-7877

TIP

If you have any suggestion of a loss of sensation, at each visit to the doctor, you should take off your shoes and socks and have your feet inspected.

The other part of a foot examination involves checking the circulation of blood to your feet. To check the circulation, your doctor does a measurement called an *ankle-brachial index* at least once every five years. The systolic blood pressure is measured in the ankle and the arm. (See the sidebar "The meaning of your blood pressure," later in this chapter, for an explanation of systolic blood pressure.) The value for the ankle is divided by the value for the arm. An index of greater than 0.9 is considered normal. A value between 0.4 and 0.9 indicates peripheral vascular disease (see Chapter 5), and a value less than 0.4 indicates severe disease.

The ankle-brachial index should be done for any person with diabetes over age 50. Patients under 50 require the study if risk factors such as smoking, high cholesterol, and high blood pressure are present.

Tracking Cholesterol and Other Fats

Most people these days know the level of their total cholesterol, but you also need tests that show levels of various types of fats in the blood.

Cholesterol is a type of fat that circulates in the blood in small packages called *lipoproteins*. These tiny round particles contain fat (*lipo*, as in liposuction) and protein. Because cholesterol doesn't dissolve in water, it would separate from the blood if it weren't surrounded by the protein, just like oil separates from water in salad dressing. (That's why you have to shake the salad dressing each time you use it.)

A second kind of fat found in the lipoproteins is *triglyceride*. Triglyceride represents the form of most of the fat you eat each day. Although you may eat only a gram or less of cholesterol (an egg yolk has one-third of a gram of cholesterol), you eat up to 100 grams of triglycerides a day. (For more on the place of fats in your diet, see Chapter 8.) The fat in animal meats is mostly triglycerides.

Four types of lipoproteins exist:

- **Chylomicrons:** The largest of the fat particles, these lipoproteins contain the fat that's absorbed from the intestine after a meal. They're usually cleared from the blood rapidly. Ordinarily, chylomicrons aren't a concern with respect to causing *arteriosclerosis* (hardening of the arteries).
- **Very-low-density lipoprotein (VLDL):** These particles contain mostly triglyceride as the fat. They're smaller than chylomicrons.
- **High-density lipoprotein (HDL):** Known as "good" cholesterol, this lipoprotein is the next smallest in size. This particle functions to clean the arteries, helping to prevent coronary artery disease, peripheral vascular disease, and strokes.

- **Low-density lipoprotein (LDL):** Known as "bad" cholesterol, this smallest particle is the particle that seems to carry cholesterol to the arteries, where it's deposited and causes hardening.

TIP

As you may imagine, doctors need to know which particle your cholesterol comes from to understand whether you have too much bad cholesterol (LDL) or a satisfactory level of good cholesterol (HDL).

You don't have to fast to test for total cholesterol and HDL cholesterol. However, you do need to fast for eight hours to find out your LDL cholesterol and triglycerides, because the blood has to be cleared of chylomicrons, which rise greatly when you eat.

WARNING

In deciding whether and how to treat the fats, you have to consider other risk factors for coronary artery disease. You're at high risk if you have diabetes and fit any of the following conditions:

- You already have coronary artery disease, stroke, or peripheral vascular disease.
- You are a male over 45.
- You are a female over 55.
- You smoke cigarettes.
- You have high blood pressure.
- You have HDL cholesterol less than 35.
- You have a father or brother who had a heart attack before age 55.
- You have a mother or sister who had a heart attack before age 65.
- You have a body-mass index greater than 30.

You're at low risk if you have none of the preceding risk factors.

Statin medications lower cholesterol and have been shown to reduce the risk of developing vascular disease in those at high risk. They have been shown to be particularly effective in reducing further events and cardiovascular mortality in people who already have had heart attacks, strokes, and established vascular conditions.

The complications of diabetes are often related to vascular conditions, and people with diabetes are already at higher risk of conditions that involve the interruption of blood supply to important organs because of diseased blood vessels, which we explain in detail in Chapter 5.

Many people with diabetes are advised to take statin medications due to their increased risk of developing vascular complications. Here are a few important things to remember when you discuss this with your doctor:

- You and your doctor may use a risk-predicting algorithm to decide whether to start a statin. Many such tools don't include important information on diet and lifestyle, which may also substantially influence the risk of vascular disease.
- Before deciding to take a statin, discuss your lipid levels, your diabetes control, any contraindication to taking a statin (such as significant liver disease), and your risk of developing vascular complications in the context of other factors.
- Statins lower cholesterol; however, it may be that they also work through anti-inflammatory and antioxidant effects on LDL cholesterol. A good diet can include foods that also have these beneficial effects.
- Statins, like all medications, may have side effects that you can discuss with your doctor if they're troublesome. Sometimes this is due to a particular statin, and sometimes it is a "class effect," which may recur no matter which statin is taken.
- In recent years, concerns have been raised that statins may increase insulin resistance and HbA1C and be associated with a higher likelihood of insulin initiation and being prescribed an increased number of glucose-lowering medications.

Measuring Blood Pressure

Many populations around the world are experiencing an epidemic of high blood pressure (*hypertension*) similar to the epidemic of diabetes. The reasons are the same:

- People are getting fatter.
- People are storing fat in the center of their bodies, the so-called *abdominal visceral fat.*
- Many countries are experiencing aging populations. The fastest-growing segment of the population is over 75 years of age. Of people age 50 to 55 with diabetes, 50 percent have high blood pressure. Of people older than 75 with diabetes, 75 percent have high blood pressure.
- People are more sedentary than before.

People with diabetes have high blood pressure more often than the nondiabetic population for a lot of other reasons besides the preceding ones:

- People with diabetes get kidney disease.
- People with diabetes have increased sensitivity to salt, which raises blood pressure.
- People with diabetes lack the nighttime fall in blood pressure that normally occurs in people without diabetes.

Doctors generally agree that a normal blood pressure is less than 140/90. For years, the *diastolic blood pressure* (the lower reading) was considered more damaging, and an elevation in that pressure was treated with greater importance than an elevation in the *systolic blood pressure* (the higher reading). More recent studies have shown that the systolic blood pressure, not the diastolic blood pressure, may be more important.

WARNING

All the complications of diabetes are made worse by an elevation in blood pressure, especially diabetic kidney disease but also eye disease, heart disease, nerve disease, peripheral vascular disease, and cerebral arterial disease (see Chapter 5).

Evidence of the importance of controlling blood pressure in diabetes first came from the UK in the landmark United Kingdom Prospective Diabetes Study, published in late 1998. This study found that a lowering of blood pressure by 10 mm systolic and 5 mm diastolic resulted in a 24 percent reduction in any diabetic complication and a 32 percent reduction in death related to diabetes.

TIP

Your doctor should measure blood pressure at every visit. Better yet, get a blood pressure device and measure it yourself. If you detect an elevation, bring it to the attention of your doctor.

Checking Your Weight and BMI

In addition to monitoring blood glucose and blood pressure, it is beneficial to measure your weight and BMI because reductions in these figures are important and can help in control of type 2 diabetes. In later chapters, we advise how to adopt a lifestyle that can achieve a healthy weight and BMI. These measures have limitations, as we discuss in Chapter 8, but they're easy to record and can give an idea of how you're managing your diet and lifestyle.

TIP

You can't get a reading of your BMI by stepping on a scale, but you can get your weight. This measurement is one of the easiest to obtain. Your doctor should measure your weight at every visit.

The National Heart, Lung, and Blood Institute makes knowing your BMI easy. Using the calculator at `www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/english_bmi_calculator/bmi_calculator.html`, just fill in your weight in pounds and your height in feet and inches, click Compute BMI, and get your result.

Maintaining a BMI in the normal range makes controlling your diabetes and blood pressure easier. Also, you must eliminate obesity as a risk factor for coronary artery disease.

Testing for Ketones

When your blood glucose rises higher than 250 mg/dl (13.9 mmol/L), or if you're pregnant with diabetes and your blood glucose is below 60 mg/dl (3.3 mmol/L), your doctor should probably check for ketones — products of the breakdown of fats. Finding ketones means that your body has turned to fat for energy. If you have high glucose and find ketones, you may need more insulin. If you have low glucose and find ketones during pregnancy, you may need more carbohydrates in your diet.

To test for ketones, you insert a test strip into your urine and observe the color. The deeper the purple color, the greater the ketone level. If you find a large amount of ketones, you should contact your physician. You can find ketone test strips online and in your local pharmacy.

Testing C-Reactive Protein

C-reactive protein (CRP) is a substance in the blood that the liver produces when infection or inflammation is present. It can be measured with a simple blood test. Diabetes is associated with several features that suggest that inflammation plays an important role in the disease. People who develop diabetes have higher C-reactive protein than those who don't. (Other substances associated with inflammation are also elevated in diabetes.)

Elevated CRP in the blood has been shown to directly contribute to blood-vessel damage and the formation of blood clots that cause heart attacks.

Drugs that improve diabetes lower the amount of C-reactive protein, which is also considered a marker for coronary artery disease.

TIP

Have your C-reactive protein measured with other blood tests about once a year. If the level is elevated, it may serve as a predictor of future diabetes or coronary artery disease. You need to work even harder to lower your blood glucose, improve your LDL and HDL cholesterol, and lower your blood pressure. About 90 percent of healthy individuals have CRP levels less than 3, and 99 percent have levels less than 10. This test isn't essential in diabetes.

Checking Thyroid Stimulating Hormone (TSH)

A screening test called the *thyroid-stimulating hormone* (TSH) level is done at the time that diabetes is diagnosed and every five years thereafter as long as it's normal. If it's abnormal then more regular testing needs to be done to monitor your response to treatment. This test is done because people with diabetes (type 1) have a higher incidence of thyroid disease than the general population, because thyroid disease is often confused with other conditions, and because hypothyroidism can lead to weight gain, which obviously isn't good for diabetes.

TSH is produced by the pituitary gland in the brain. When the thyroid gland makes the right amount of thyroid hormone, the pituitary produces the right amount of TSH to keep it working properly. The normal level in the blood is 0.5–2.5 microunits per milliliter (μU/ml).

When the thyroid makes inadequate amounts of thyroid hormone, the pituitary increases its production of TSH to stimulate the thyroid, and values of 10 or more μU/ml aren't uncommon. When the thyroid makes too much thyroid hormone, it causes the pituitary to turn down its production of TSH, and values less than 0.5 μU/ml are found.

Too much thyroid hormone leads to insulin resistance, making diabetes worse than before. Too little thyroid hormone increases insulin sensitivity, so people with low thyroid function have reduced levels of blood glucose.

TIP

Low levels of thyroid hormone cause an elevation in the hemoglobin A1C in patients who don't have diabetes as well as those who do. Replacing the thyroid hormone lowers the A1C to normal if diabetes isn't present.

Evaluating Testosterone in Men with Type 2 Diabetes

One study showed that about one-third of men in the United States over the age of 65 have low levels of testosterone, and a similar percentage of those men have diabetes. Low testosterone is associated with changes in body composition that promote diabetes like increased fat and decreased muscle. According to tests done so far, giving testosterone to these men hasn't resulted in persistent improvement in glucose metabolism. It isn't clear whether the lower levels of testosterone sometimes seen with type 2 diabetes, obesity, and hypertension are related to the causes of these conditions or are an effect of having them.

Older men who have significant reduction in muscle mass and increase in fat should have their testosterone measured. If very low, you may consider treatment with testosterone. Such patients should at least make a major effort to increase exercise and decrease caloric intake, which often results in a rise in testosterone. The long-term effects of testosterone therapy aren't entirely clear, and specialists may have different views in different countries about the value of using testosterone replacement in these circumstances. Some physicians may discourage even taking the test, because of the lack of clarity about what to do with the result.

Checking Vitamin D

Recent studies suggest a relationship between low levels of vitamin D and the development of both type 1 and type 2 diabetes. Communities that live farthest from the equator, which get less sun to make vitamin D, have the highest incidence of type 1 diabetes. Vitamin D protects the body from autoimmunity (where the body attacks itself), and type 1 diabetes is an autoimmune disease. High levels of vitamin D are associated with a lower risk of developing type 2 diabetes. In one study, people who were prediabetic were given vitamin D over three months and showed a significant improvement in glucose metabolism and reduction in hemoglobin A1C. Severe vitamin D deficiency has been shown to predict death and heart attacks in both type 1 and type 2 diabetes.

A study in the *Journal of Clinical Endocrinology and Metabolism* in September 2010 showed that blood vitamin D levels were low in obese women. The greater the degree of obesity, the lower the vitamin D. When weight was lost, the vitamin D level rose and the insulin resistance declined.

TIP

Have your vitamin D level measured with a blood test if you have prediabetes or diabetes. Take supplemental vitamin D if the level is low.

IN THIS CHAPTER

- Understanding the basics of nutrition
- Choosing the best foods for managing diabetes
- Reducing your weight
- Getting to know types of nutritional plans and traditional diets

Chapter 8
Finding Your Best Treatment: Diet

More and more people around the world are becoming overweight, and associated with this increase, we are seeing a dramatic rise in type 2 diabetes. In 2017, the World Health Organization reported that in the world's population 39 percent of adults were overweight and 13 percent were obese.

Diets and lifestyles have changed in many ways over the last 50 years. It's no coincidence that during the period when populations have seen increases in obesity and diabetes, we've had consumption of larger meal portions and have seen a threefold increase in the quantities of refined carbohydrates and simple sugars. Also, the recommendation to reduce fat intake in recent years has resulted in the replacement of foods high in fat with others that are high in sugar, driving the increase in rates of obesity. Concerns about dietary fat causing high levels of cholesterol in the blood and resulting in heart disease have been shown to apply to certain types of saturated fat. People need to focus more on the *types* of fats in foods rather than *total* fats in the diet. Some very healthy traditional diets are rather high in "good" fats such as those found in olive oil, avocados, fish, and nuts.

For those living with diabetes, many of whom are overweight, appropriate nutrition and weight loss aren't just options but necessities. Sustained changes in what you eat can make a significant difference to weight and diabetes control and can

be measured in improvements in HBA1C, even preventing or reversing the diagnosis of diabetes.

In this chapter, you find out all you need to know to make your diet work for you, not only to improve your diabetes and control your blood glucose but also to feel generally that you have an improved quality of life.

Making the Most of Your Diet: Choosing the Best Foods

The word *diet* has more than one meaning. We often think of "dieting" as restricting or substituting foods when the goal is to lose weight. The word actually derives from the ancient Greek word *diaita*, which meant "way of life." That concept much more closely describes the nutritional patterns of traditional diets in which a person enjoys healthy natural foods in a broader social context.

Most people who consciously choose a diet probably do so to attempt to lose weight. This is often a temporary departure from their usual eating habits, and even when a few pounds are lost, the evidence suggests that when they return to their previous ways, they put that weight back on.

REMEMBER

When choosing a way of life that includes eating healthful and nutritious food for prevention, reversal, or the best control of diabetes, the diets that we recommend and explain in detail later in this chapter, all follow these five principles:

- **Provides optimum control of blood sugar:** We explore this more in the section "Considering important factors for type 2 diabetes," later in this chapter.
- **Helps to achieve and maintain a healthy weight, which is especially important for those with diabetes who are overweight:** We explore this more in the section "Reducing Your Weight."
- **Has been shown to reduce the risk of other diseases, in particular those that are more common as complications of diabetes:** We explore this more in the section "Introducing macronutrients — the big three."
- **Good diets are sustainable so that its glycemic control, healthy weight, and anti-inflammatory benefits are maintained in the long term:** In other words, it's enjoyable, varied, and tasty and can be incorporated into daily life.
- **Is ethical and sustainable for the environment and planet:** This is now becoming an essential requirement for any dietary pattern.

Choosing the right foods is the key to having the best diet for diabetes. Although this sounds obvious, many diets actually promote powders or shakes as food substitutes or focus on the foods to avoid or restrict rather than the ones to include. Some advocate a focus on macronutrients, which can be difficult to translate into foods, especially when foods can vary so much in how they're produced and prepared.

One of the things that makes choosing the right food difficult is that foods, and even raw ingredients, that are called the same thing can differ, depending on their quality and the way they're made. For example, the processed yellow cheese found on a cheeseburger has a significant nutritional difference from a cube of feta cheese produced by hand using milk from free-roaming sheep or goats. Similarly, a jar of store-bought pasta sauce may have different ingredients from the jar next to it, and both may contain things that wouldn't be present in one prepared from scratch in the kitchen.

Getting to Know the Basics of Nutrition

The nutrients from foods we need to sustain life are broken down into categories depending on their chemistry, quantity, and function. This is perhaps a little oversimplistic because nutrients have more than one purpose, can influence the effects of other nutrients, and can be handled differently from person to person depending on genetics and their gut microbiome.

The three *macronutrient* categories are carbohydrates, proteins, and fats. These are the nutrients found in the largest volume providing calories and energy. *Micronutrients* are also essential for life and include vitamins and minerals. Other compounds in foods aren't strictly speaking nutrients — they're not critical for survival, but they're very important for the maintenance of good health, having been found to significantly reduce the risk of chronic diseases. Carotenoids, polyphenols, and sulfur compounds found in many plants are examples of these *bioactive compounds,* which we discuss later in this section in the context of their possible antioxidant and anti-inflammatory benefits.

REMEMBER

Foods may be mainly (or even entirely) made up of one type of macronutrient, but considering a food as only "a carbohydrate" or only "a fat" is a mistake. Beans are a great source of protein but also contain carbohydrates. Fish can be a great source of protein, but fish — especially oily fish — also contain healthy fats. Although olive oil contains no proteins and no carbohydrates and so may be considered "a fat," that description fails to acknowledge the micronutrients it contains, like vitamin E. Unprocessed or "raw" honey is a carbohydrate and contains simple sugars but also contains numerous bioactive compounds that may have benefits for health.

Introducing macronutrients — the big three

Proteins, consisting of amino acids, are often described as the building blocks of life, forming the structural components in cells especially needed for growth and strength. Proteins can also be used for energy and in the production of hormones — the chemical messenger systems in the body. Plant sources of proteins include legumes, beans, nuts, seeds, and some whole grains. Meat, dairy products, eggs, fish, and insects are animal sources of protein.

Carbohydrates, consisting of small or much larger molecules of sugars, fiber, and starches, are the main chemicals the body "burns" for energy to think, move, and maintain life. Carbohydrates have other roles — for example, in the functioning of the immune system. Sources of carbohydrates include vegetables, fruits, milk, honey, and grains, including pasta, bread, and rice, as well as the cane table sugar that may be added for sweetness. So-called "convenience" foods — including sodas — that are highly processed may well have added sugars in large quantities.

Fats, consisting of saturated, polyunsaturated, and monounsaturated types, are essential for cell walls, insulation, and energy, as well as having other roles in the body. Foods containing fats are usually made up of different proportions of saturated, polyunsaturated, and monounsaturated fats.

- Some saturated fats have been implicated in raising blood cholesterol and thereby increasing heart disease. However, some saturated fats may not raise blood cholesterol levels. Saturated fat sources include meat and dairy products, especially processed meats like sausages.
- Polyunsaturated fats are called omega-6 and omega-3, and they may help improve cholesterol profiles. The excess of omega-6 polyunsaturated fats found in some vegetable and seed oils as well as many processed foods in comparison with omega-3 polyunsaturated fats found in oily fish and many nuts and seeds may promote harmful inflammation. In Western diets, the ratio of omega-6 to omega-3 fats is approximately 16 to 1 rather than an ideal of 4 to 1, which is found in many healthy traditional diets.
- Monounsaturated fats are considered healthy fats because they don't adversely affect cholesterol levels. Monounsaturated fats sources include olive oil, nuts, and avocados.

WARNING

Another type of fat are trans fats, which are also called hydrogenated or partially hydrogenated oil on food labels. They were used widely in the food industry to stabilize margarines, spreads, and other products but have now been found to be extremely dangerous to health, dramatically increasing the risk of heart disease. Many governments have passed laws to limit or eradicate their use.

REMEMBER

Dietary cholesterol doesn't influence *blood* cholesterol level to the extent that was once thought, and cholesterol, where it naturally occurs in foods like eggs and shrimp, is no longer considered to significantly raise cholesterol in the blood. The debate about the importance of the cholesterol the body makes from some types of saturated fats, particularly those found in fatty meats, continues to attract controversy, largely about the exact way in which blood cholesterol translates to heart disease and strokes.

Getting enough vitamins, minerals, and water

Your diet must contain sufficient vitamins and minerals, but the amount you need may be less than you think. If a generally healthy person eats a balanced diet that comes from the various food groups, they usually get enough vitamins for their daily needs. However, people with diabetes and other chronic health conditions may have various vitamin deficiencies depending upon their medications and medical history. It's a good idea to get any relevant vitamin and mineral levels checked with your doctor. In addition, keep in mind that certain nutrients are particularly beneficial to people with diabetes. Table 8-1 gives a brief summary of the function of vitamins. Many vitamins affect the healthy function of organs that can be effected by diabetes, so optimal levels are important for diabetes. For more information on vitamins, please refer to *Diabetes Meal Planning & Nutrition For Dummies* (John Wiley & Sons).

Table 8-1 lists the vitamins and their food sources.

As you look through the vitamins in Table 8-1, you can see that most of them are readily available in the foods you eat every day. In certain situations, such as if you're pregnant, you may need to take a vitamin supplement so you can be sure that you're getting enough every day. Some evidence also suggests that extra vitamin C may protects against colds. People on a vegan diet may not get enough vitamin B12 and so often are advised to take supplements.

Vitamin D is important for bone health and probably plays a part in other aspects of health. It has been shown that people who are deficient in vitamin D have increased risk of developing certain types of cancer. Although some vitamin D comes from the food you eat, the majority is produced in the skin when exposed to sunlight. Modern lifestyles, where people spend much of their time in offices or cars, mean that they don't get even a few minutes of gentle sun exposure outdoors each day. Many people could benefit from taking vitamin D supplements, especially during the winter months. Alternatively, a half hour walk even on a cloudy day gets some boosting of vitamin D levels without risking the skin damage of sunburn that's known to be linked to skin cancers. It also improves mental health and disposition as well as provides physical exercise.

TABLE 8-1 Vitamins You Need

Vitamin	Function	Food Source
Vitamin A	Needed for healthy skin, bones, and eyes	Milk and green vegetables
Vitamin B1 (thiamin)	Converts carbohydrates into energy	Meat and whole-grain cereals
Vitamin B2 (riboflavin)	Needed to use food properly	Milk, cheese, fish, and green vegetables
Vitamin B6 (pyridoxine), pantothenic acid, and biotin	Needed for growth	Liver, yeast, and many other foods
Vitamin B12	Keeps the red blood cells and the nervous system healthy	Animal foods (for example, meat)
Folic acid	Keeps the red blood cells and the nervous system healthy	Green vegetables
Niacin	Helps release energy	Lean meat, fish, nuts, and legumes
Vitamin C	Helps maintain supportive tissues	Fruit and potatoes
Vitamin D	Helps with absorption of calcium	Fortified dairy products, oily fish, mushrooms, and eggs; also made in the skin when exposed to sunlight
Vitamin E	Helps maintain cells	Oils and whole-grain cereals
Vitamin K	Needed for proper clotting of the blood	Leafy vegetables; also made by bacteria in the intestine

WARNING

As far as the other vitamins go, the proof just doesn't exist that large amounts of the vitamins are beneficial, and in some cases, they may be harmful. We don't recommend that you take megadoses of these vitamins. Have a blood panel done to reveal whether you're deficient in any vitamins or minerals, and then consult with your doctor on whether you need any supplementation.

Minerals are also key ingredients of a healthy diet. Most are needed in tiny amounts, which are easily consumed from a balanced diet. Keep the following in mind:

- Calcium, phosphorus, and magnesium build bones and teeth. Milk and other dairy products provide plenty of these minerals, but evidence suggests that people aren't getting enough calcium, especially during important phases of life such as pregnancy, adolescence, and in later life unless they're taking an optimum diet rich in green leafy vegetables and dairy products.

  Magnesium intake may also be less than desirable unless people include foods such as nuts, seeds, avocados, beans, leafy greens, whole grains, and

dark chocolate. It's now becoming recognized that magnesium deficiency is much more common than was once thought and much more relevant for people with diabetes. Scientists are discovering the importance of magnesium when it comes to supporting nerve and muscle function. Also, if people are chronically deficient in magnesium, they may not necessarily experiencing any immediate symptoms, but they may be at increased risk of problems with their hearts and, intriguingly, at risk of developing type 2 diabetes.

- Iron is essential for red blood cells and is present in meat and some nuts, legumes, and vegetables. However, a menstruating woman tends to lose iron and may need a supplement.
- Sodium regulates body water. You need only about 220 milligrams a day, but you likely take in 20 to 40 times that much, which probably explains a lot of the high blood pressure in the United States. Because hypertension is so prevalent in both types of diabetes and makes diabetic complications occur earlier, reduction of salt intake is an important consideration. Don't add salt to your food (it already has plenty in it), and you'll enjoy the taste a lot more without it.

TIP

Unrefined sea salt, which is relatively inexpensive, isn't processed and can be purchased at health food and organic stores. It's a great option because it still contains the original vitamins and minerals that are stripped from conventional table salt. The body has an easier time of digesting the sodium from the unprocessed source, and it doesn't provide the negative effects often associated with sodium when used in small quantities.

Actual sodium and potassium deficiencies from diets are very rare because these minerals are found in so many foods and because the kidneys make sure that they're balanced. However, it has been shown that diets with low levels of added salt and with plenty of vegetables and fruits rich in potassium can be beneficial, including reducing the risk of blood pressure problems.

- Chromium is needed in tiny amounts. There is some limited evidence to suggest that chromium has a role in improving blood sugar metabolism in obese people and those with type 2 diabetes. However, routine chromium supplementation has not been advised in the American Diabetes Association's guidelines because it is felt that more research is needed to establish the precise effects of taking chromium supplements.
- Iodine is essential for production of thyroid hormones. In some countries, it's added to commercial salt preparations to assure that people get enough of it. In many areas of the world where iodine isn't found in the soil, people suffer from very large thyroid glands known as *goiters.*
- Various other minerals, like chlorine, cobalt, tin, and zinc, are found in many foods. These minerals are rarely lacking in the human diet.

FROM THE AUTHORS

From Dr. Poole: Minerals from food are dependent on the soil in which they're grown. Some intensive farming techniques have reduced the amounts of minerals and trace elements in foods. Other farms celebrate their soil, encouraging biodiversity and using long-established agricultural methods that ensure plants are grown in mineral-rich environments. This can sometimes even add to the taste of foods. For example, the fava beans of Santorini or the wines of Sicily are celebrated for their growth in rich volcanic soils.

TIP

Water is the last important nutrient we discuss in this section, but it's by no means the least important. Your body is made up of 60 percent or more water. All the nutrients in the body are dissolved in water. You can live without food for some time, but you won't last long without water. Water can help give a feeling of fullness that reduces appetite. In general, people don't drink enough water. According to the Institute of Medicine (the health arm of the National Academy of Sciences), men need to get a minimum of 13 cups, or 104 ounces, whereas women need 9 cups, or 72 ounces, of water a day from all sources (that is, from all the foods and liquids you ingest).

Eating well for type 1 diabetes

A person with type 1 diabetes takes insulin to control blood glucose. At this time, the techniques doctors and patients use to try to match the human pancreas can't replicate the way that it releases insulin just when the food is entering the bloodstream so that the glucose remains between 80 and 120 mg/dl. Therefore, diabetic patients need to make sure that their food enters as close to the expected activity of the insulin as possible.

The dietary choices for people with type 1 diabetes may be different from those with type 2 diabetes. In particular, they may not need to lose weight. Also, the intake of food, especially carbohydrates, needs to correspond with insulin timing and doses to make sure that levels of sugar are maintained to neither rise too high nor fall too low. This book is mainly concerned with type 2 diabetes.

Considering important factors for type 2 diabetes

Diabetes is all about glucose metabolism, and the glucose in foods comes from carbohydrates in the forms of simple sugars or more complex molecules that are broken down to release sugars.

Carbohydrates are the sources of energy that start with *glucose*, the sugar in your bloodstream that is one sugar molecule, and include substances containing many sugar molecules called *complex carbohydrates*, *starches*, *cellulose*, and *gums*. Some

of the common sources of carbohydrates are bread, potatoes, grains, cereals, and rice.

Physicians know a lot of information about carbohydrates in the body:

- Carbohydrate is the primary source of energy for muscles.
- Glucose is the carbohydrate that causes the pancreas to release insulin.
- Carbohydrate causes the triglyceride (fat) level to rise in the blood.
- When insulin isn't present or is ineffective, more carbohydrate raises the blood glucose higher.

Although the fat intake of the U.S. population has declined because of the fear of coronary artery disease caused by cholesterol, Americans are getting fatter. In fact, 69 percent of Americans are considered overweight or obese according to the U.S. Department of Health and Human Resources. Because Americans aren't eating more protein, the culprit is most likely excess carbohydrates, such as that found in concentrated sweets like pastries and candy, as well as the more complex carbohydrates found in bread. Within the body, carbohydrates can be turned into fat and stored. This function was great when everyone lived in caves and got little food for prolonged periods of time, but it doesn't fit today's lifestyle.

Because carbohydrate is the food that raises the blood glucose, which is responsible for the complications of diabetes, it seems right to recommend a diet that is lower in carbohydrate than previously suggested. Furthermore, a major source of coronary artery disease in diabetes is metabolic syndrome (see Chapter 5). Because increased carbohydrate triggers increased triglyceride, which is the beginning of a number of abnormalities that lead to increased coronary artery disease, recommending less carbohydrate on this basis as well seems prudent.

All carbohydrates aren't alike in the degree to which they raise the blood glucose. This fact was recognized some years ago, and a measurement called the *glycemic index* (GI) was created to quantify it. The world owes a lot to Professor David Jenkins and his colleagues for their pioneering work in this field. The glycemic index uses white bread as the indicator food and assigns it a value of 100. Another carbohydrate of equal calories is compared to white bread in its ability to raise the blood glucose and is assigned a value in comparison to white bread. A food that raises glucose half as much as white bread has a GI of 50, whereas a food that raises glucose 1.5 times as much has a GI of 150. People who eat high GI foods on a regular basis have a higher risk of developing diabetes.

REMEMBER

The point is to select carbohydrates with low GI levels to try to keep the glucose response as low as possible. A glycemic index of 70 or more is high, 56 to 69 is medium, and 55 or less is low.

Good clinical studies have shown that knowledge of the glycemic index of food sources can be valuable. Evaluating diets of people who develop diabetes compared with those who don't shows that, all other things being equal, the people with the highest GI diet most often develop diabetes. After diabetes is present, patients who eat the lowest GI carbohydrates have the lowest levels of blood glucose. Patients in these studies have been able to change to a low GI diet without much difficulty. The other thing that happens when low GI food is incorporated into a diet is that the levels of triglycerides and LDL (or "bad" cholesterol) fall in both type 1 and type 2 diabetes.

TIP

Switching to low GI carbohydrates can be very beneficial for controlling glucose and losing weight. You can easily make some simple substitutions in your diet, as shown in Table 8-2.

TABLE 8-2 Simple Diet Substitutions

High-GI Food	Low-GI Food
White bread	Whole-grain bread, or use lettuce leaves or portabella mushrooms for making sandwiches
Processed breakfast cereal	Unrefined grains like oats, quinoa, millet, and barley
Plain cookies and crackers	Cookies made with dried fruits or whole grains like oats
Cakes and muffins	Cakes and muffins made with fruit or whole grains like oats
Tropical fruits like bananas	Temperate-climate fruits like apples and plums
Potatoes	Whole wheat pasta or pasta made from special low-GI flours and legumes
White rice	Basmati and other low-GI rice

Because bread and breakfast cereals are major daily sources of carbohydrates in the United States, these simple changes can make a major difference in lowering your glycemic index. For even better results, use the breakfast recipes in the Appendix in this book. Foods that are excellent sources of carbohydrate but have a low GI include legumes such as peas or beans, pasta, grains like barley, parboiled rice (rice that is partially boiled in the husk, making it nutritionally similar to brown rice), bulgur, and whole-grain breads.

REMEMBER

Even though a food has a low GI, it may not be appropriate because it's too high in fat. You need to evaluate each food's fat content before assuming that all low-GI foods are good for a person with diabetes.

On the other hand, although a food has a high GI, it may still be acceptable in your diet if it contains very little total carbohydrate. For example, cantaloupe has a GI of about 70, but the amount of total carbohydrate is so low that it doesn't raise your blood glucose significantly when you eat a normal portion. This concept is called the *glycemic load* (GL), a number that takes both glycemic index and total carbohydrates into account. A GL of 20 is high, 11 to 19 is medium, and 10 or less is low. The glycemic load is perhaps more useful than the glycemic index because it measures the impact of combinations of foods when eaten together which more realistically reflects what happens when we eat a meal.

If you dive in to this subject in deeper detail, you can find a listing of many foods by category of food and by level of GI, portion size, and GL at `www.glycemicindex.com`.

FIBER

Fiber is the part of the carbohydrate that isn't digestible and, therefore, adds no calories. Fiber is found in most fruits, grains, and vegetables. It helps reduce the glycemic index of food, making it particularly beneficial for those with diabetes. One of the great advantages to eating foods rich in fiber is they promote a sense of fullness when you consume them. Fiber comes in two forms:

- **Soluble fiber:** This form of fiber can dissolve in water and has a lowering effect on blood glucose and fat levels, particularly cholesterol.
- **Insoluble fiber:** This form of fiber can't dissolve in water and remains in the intestine. It absorbs water and stimulates movement in the intestine. Insoluble fiber also helps prevent constipation and possibly colon cancer. This fiber is called *bulk* or *roughage.*

Before the current trend to refine foods, people ate many sources of carbohydrate that were high in fiber. These sources were all plant foods such as fruits, vegetables, and grains. Animal foods contain no fiber.

Because too much fiber causes diarrhea and gas, you need to increase the fiber level in your diet fairly slowly. The recommendation for daily fiber is 20 to 30 grams. Most Americans eat only about 15 grams daily. Beans are a great source of fiber and can help people reach the recommended daily intake of fiber with ease. On average beans provide, seven or more grams of fiber per half-cup serving. Remember to increase your intake of water considerably as you increase your fiber intake for your body to ease digestion.

Many of the foods listed in the previous section as having a low glycemic index contain a lot of fiber, which helps to reduce the blood glucose.

Consuming the right amount of calories and carbohydrates

The way to eat the right amount of carbohydrate without increasing your blood glucose or triglycerides is to make it a low-glycemic, high-fiber carbohydrate. Such a diet has been shown to reduce the need for insulin in women with gestational diabetes without any negative effect on the fetus or mother. Increased dietary fiber intake has been shown to reduce the risk of death, not only from heart and blood vessel disease but also from infectious respiratory diseases.

Restricting dietary carbohydrate can help manage both type 1 and 2 diabetes. Decreasing carbohydrates (especially those with a high GI) while increasing lean proteins such as fish with heart-healthy fats such as avocado and extra-virgin olive oil can be very effective. Choose the majority of your carbohydrates from complex sources, including

- Quinoa
- Sweet potatoes
- Brown rice
- Oats
- Whole grains
- Lentils
- Barley
- Beans
- Legumes
- Potatoes
- Carrots
- Millet
- Rice
- Farro

Achieving and Maintaining a Healthy Weight

Achieving and maintaining a healthy weight

- Markedly reduces the risk of developing type 2 diabetes.
- Prevents the progression of prediabetes (see Chapter 2) into type 2 diabetes.
- Can reverse the failure to respond to drugs for diabetes that develops after responding at first (see Chapter 10).
- Reduces the risk of death from diabetes.
- Increases life expectancy in patients with type 2 diabetes.

- Has beneficial effects on high blood pressure and abnormal fats (see Chapter 7).

REMEMBER

In this book, when we refer to weight loss or maintaining a healthy weight, we're talking about the steady and consistent journey through positive lifestyle changes to achieve and maintain a healthy weight for *you.* It's important that this feels comfortable for you, is sustainable, and is optimal for reducing the risk of illness. Healthy longevity can be a truly enjoyable and attainable goal. Obsessive and excessive weight loss can be just as harmful as being overweight. Discussing eating disorders is beyond the scope of this book, but you can find more information at the National Eating Disorders Association and other reputable organizations specializing in this subject area.

Considering medications when you need to lose weight

The pharmaceutical industry has tried for many years to produce a pill for weight loss. Some weight loss drugs do exist, and no doubt others will be introduced to the market in the years to come, but in general, medications for weight loss lead to disappointment and even harm.

Drugs have been licensed for use in some circumstances, and authorities such as the FDA in the United States and the National Institute for Health and Care Excellence in the United Kingdom have advised when and how they should be used. However, using drugs for weight loss comes with several problems, including the following.

- They're expensive and targeted at weight loss rather than promoting a healthy lifestyle.
- They're part of the quick-fix culture that fails to appreciate weight in the context of overall health.
- They frequently have side effects and can be abused.
- Just like crash diets, they don't provide a sustainable way to keep weight off.

Most concerning is the tendency for drugs to be licensed based on evidence submitted by the pharmaceutical industry and for them to be withdrawn due to safety concerns within a few years. A review article published in 2016 looked at 25 anti-obesity medications withdrawn from the market between 1964 and 2009 and found that more than 80 percent of these drugs were associated with serious psychiatric and cardiovascular side effects. Deaths were linked with more than a quarter of these medications. Most recently, lorcaserin (Belviq) has been withdrawn from the U.S. market due to concerns about an increased risk of cancers,

and in 2022, the European Medicines Agency recommended that amfepramone should no longer be authorized because of side effects from its inappropriate use.

Weight management plans

Commercial companies, celebrities, and public health bodies and medical professionals promote numerous weight management plans. The global weight loss and management industry was valued at $192 billion in 2019 and projected to rise to $295 billion by 2027. To consider all the available plans is beyond the scope of this book, not least because there are so many and they're so varied, but we can give a general overview.

Many commercial diets are based on very little scientific evidence and may be confined to meal substitutes and products that you have to purchase. Some promise amazing results in short periods of time, and others can be highly restrictive, even to the point of risking significant harm to health. Many diet plans, while effective in the short term, aren't sustainable in the long run and result in "yo-yo" weight loss and gain.

As a society, we still have a lot to learn about achieving and maintaining a healthy weight. We don't fully understand the role of genes or the important role of gut microbiome.

Societal pressure to be thin and to have a "perfect" body has resulted in harm to many people, exacerbating eating disorders and mental health problems. The advertising and fashion industries are finally acknowledging the dangers of featuring models who are underweight, but there's still a misperception about beauty and body weight.

The trouble with being overweight is in the harm it can cause to a person's mental and physical health. Shame and low self-esteem can be consequences of being overweight but aren't helpful and aren't inevitable. The same is true of physical health.

Medical advice should focus on achieving a healthy weight but also be tailored to individual patients. For example, in later life, it has been shown that there can be advantages in having a BMI slightly higher than the definition of normal weight because this may well represent good lean muscle mass and bone density, both of which are beneficial to health. Evidence also supports the notion that having a good diet is more important than focusing entirely on weight. Research from Uppsala University in Sweden published in 2020 showed that a high adherence to a Mediterranean diet in overweight people was associated with lower mortality when compared with people of normal weight consuming a less healthy diet.

The advice from health professionals and government agencies has also included some mistakes and limitations along the way.

The definition of being overweight is most often based on body-mass index (BMI). Although this is a useful guide, it's by no means perfect and has some limitations. (See Chapter 2 for more information about BMI.)

The number of calories, which describes the amount of energy in foods, is a widely used measure of how likely an ingredient or meal is to cause weight gain. This can also be a helpful indicator of how much energy you're consuming, but calorie counting alone can be misleading. It's now known that people don't simply take calories in from food, burn the energy they need, and deposit the excess as fat.

For example, although fat contains three times the calories per ounce or gram than proteins or carbohydrates, different types of fats have a different tendency to result in weight gain, can reduce the glycemic load of a carbohydrate-rich meal, and can increase satiety, which may result in a lower intake of overall calories in a meal. Before this was fully understood, the higher caloric value of fats and the association between certain fats and raised cholesterol levels considered a factor in heart disease resulted in advice that people should consume a low-fat diet. Despite the evidence supporting the Mediterranean diet as a relatively high-fat diet that's associated with a healthy weight and low rates of heart disease, the demonizing of fat for its calorie content continues in many nutritional scores and warning indicators on foods.

The distinction between a healthy diet rich in the monounsaturated fats of olive oil, nuts, and avocados and a poor-quality low-fat diet is still underrecognized. Not only did the low-fat dietary advice of recent decades direct people away from some healthy foods, it almost certainly created an environment where the replacement of fats in the diet with poor-quality carbohydrates such as low-fat, high-sugar yogurts, cereals, and cookies has increased sugar intake. At the same time, vitamins, minerals, and antioxidants in natural foods have been shunned because of their high fat content.

People used to think that they could offset the calorie energy input entirely by exercising and that they could eat as many calories as they liked, so long as they exercised to burn them up. This assumption was also based on the belief that you could apply the simple equation of "calories in and calories out." Although exercise is amazingly good for you, does indeed burn calories, and should definitely be part of a weight management plan, its impact on weight isn't quite as much as might be anticipated.

Another false assumption, which is perhaps worst of all, is that someone who is overweight is to be blamed and that shaming people who are overweight will help them lose weight. This attitude is entirely unsupportive, and the evidence is clear that this approach is counterproductive and has a negative impact. Health

professionals have a particular responsibility to be aware of this and also to be cognizant of their own unconscious prejudices and biases, which may be expressed nonverbally during a consultation.

When it comes to achieving and maintaining a healthy weight, it is best to

- Apply the five principles of a good diet described in this chapter's introduction and make the best food choices.
- Incorporate good-quality fats, lean animal or plant proteins, and low-GI carbohydrates in each meal.
- Be aware of the contribution of your behavioral and lifestyle choices, including where and how you eat.
- Aim for a healthy BMI but be aware of its limitations as a measure of health.
- Be conscious of calories but avoid obsessive calorie counting.
- Enjoy exercise for its own sake but remember you can't outrun a bad diet!
- Be aware of portion sizes and enjoy eating food thoughtfully and slowly.

Comparing nutritional plans for healthy weight management

People who follow typical Western diets start from a point of eating too many high-GI, low-quality carbohydrates, which are often present in ultra-processed foods and drinks with added sugars in the form of high fructose corn syrup and other ingredients. This style of diet often includes processed white bread, rice, and pasta where the fibrous outer husk that controls sugar release is stripped away. The best dietary advice is to reduce these simple or added sugars and high-glycemic processed foods and to increase the proportion of low-glycemic whole grains and vegetables with a complex rather than simple carbohydrate profile.

Research has shown that it's possible to lose weight in the short term on several different diets, including Mediterranean, low-carbohydrate, and vegetarian diets. Short-term weight loss may be useful for shedding a few pounds before a wedding or the summer beach vacation, but what's really important is to show that a diet can sustain weight loss over a period of time and reduce the risk of chronic illnesses. Some low-carbohydrate plans advocate the indiscriminate replacement of carbohydrates with unhealthy fats and proteins from meat products, the effects of which may be to increase the risk of heart disease and contribute to climate change. When we look at evidence of which weight loss plans work, it's essential to also look at the effect of a diet on the risk of diabetes as well as other conditions like heart disease and high blood pressure.

A few studies have compared different nutritional plans to see which achieves weight loss most successfully. One such head-to-head comparison of reduced-calorie, low-fat, low-carbohydrate, and Mediterranean diets was published in the *New England Journal of Medicine*. Through follow-up with the participants over several years, the Mediterranean diet was determined to be the most successful in terms of long-term weight loss to achieve a healthy weight and was more sustainable. In 2019, a review article entitled "The Mediterranean Diet, When the Evidence Speaks," published in the journal *Nutrients*, cited numerous studies showing not only weight loss and reduced chances of becoming obese but also reduced risks of type 2 diabetes and heart disease.

The larger the numbers of participants included in studies, the more reliable the scientific evidence. One meta-analysis, including more than 1,000 people with type 2 diabetes published in the *European Journal of Clinical Nutrition* in 2014, confirmed that a Mediterranean-style diet improves outcomes of body weight, glycemic control measured by HBA1C, and cardiovascular risks. Another meta-analysis looked at the incidence of *metabolic syndrome,* where obesity, high blood pressure, and type 2 diabetes exist together. It included more than half a million subjects from 50 studies and was published in the *Journal of the American College of Cardiology* in 2011. Demonstrating that the Mediterranean diet significantly reduced the risks of metabolic syndrome, the authors concluded, "These results are of considerable public health importance, because this dietary pattern can be easily adopted by all population groups and various cultures and cost effectively serve for primary and secondary prevention of metabolic syndrome and its individual components."

MANAGING PORTION SIZE

Portion sizes have increased significantly both in restaurants and at home. The average size of a plate has also increased, as well as the size of a glass of wine — a large glass in many restaurants is equivalent to a third of a bottle. Here are correct portion sizes for several foods:

- Three ounces of meat is the size of a deck of playing cards.
- A medium apple or peach is the size of a tennis ball.
- One ounce of cheese is the size of four dice or a precut slice of cheese.
- One-half cup of ice cream is the size of a tennis ball.
- A cup of mashed potatoes is the size of your fist.
- A teaspoon of butter or peanut butter is the size of the tip of your thumb.
- One-half cup of nuts is the size of a golf ball.

Understanding the Mediterranean diet

The Mediterranean diet is a modern eating plan based on the traditional diet and lifestyle of the countries bordering the Mediterranean Sea. The Mediterranean diet is known as the healthiest in the world because of its ease of use, staying power, and flavorful foods. You don't have to completely give things up when following a Mediterranean diet.

FROM THE AUTHORS

We recommend the Mediterranean diet (which has for many successive years been described by *US News & World Report* as the best diet) for not only achieving a healthy weight but for prevention and potential reversal of diabetes, for control of established diabetes, and because it confers benefits by reducing the risk of complications associated with diabetes. In the recipes in the appendix, we bring together ingredients from other traditional diets across the world to create examples of beautiful meals for everyone and especially a person with diabetes.

It's not truly a diet but rather a lifestyle that prescribes a lot of what we should eat and a little of what we shouldn't along with shared physical and social activities. Oldways, a nonprofit food and nutrition education organization that created the Mediterranean Diet Pyramid (see Figure 8-1), refers to the Mediterranean diet as "the gold standard eating pattern that promotes lifelong good health."

The Mediterranean diet is recommended by the World Health Organization and numerous public health institutions and government health agencies. In addition, the illustrious and respected committee who prepares the *US News & World Report* annual ranking of diets has for many successive years awarded the top spot to the Mediterranean diet not only as the best diet overall but the best diet for diabetes.

The base of the Mediterranean Diet Pyramid (see Figure 8-1) shows the importance Mediterranean cultures place on enjoying meals with others and being physically active. Regardless of religion, ethnicity, or language, the people of the Mediterranean region share a common desire to spend time eating and socializing with friends. In the countries of the Mediterranean region with large Muslim populations, there are even prophetic sayings encouraging believers to choose who they eat with before they decide what to eat.

The Mediterranean Diet Pyramid reveals the majority of items that should be eaten or practiced at the wider, bottom portion of the triangle. The items that should be eaten sparingly appear at the top. Following the Mediterranean involves traditional means of preparing and eating natural, whole foods, getting regular physical activity, and making a commitment to prepare and eat foods in community whenever possible.

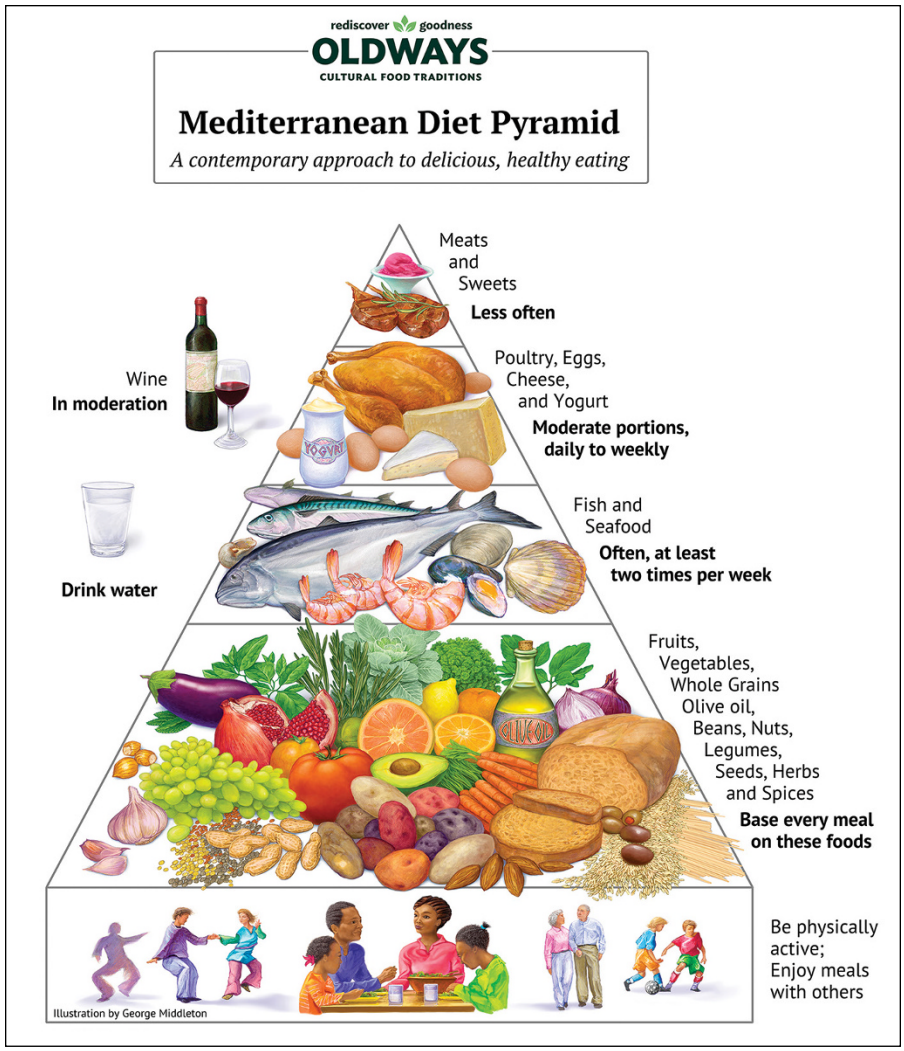
rediscover goodness
OLDWAYS
CULTURAL FOOD TRADITIONS
Mediterranean Diet Pyramid
A contemporary approach to delicious, healthy eating
Meats and Sweets
Less often
Poultry, Eggs, Cheese, and Yogurt
Moderate portions, daily to weekly
Wine
In moderation
Fish and Seafood
Often, at least two times per week
Drink water
Fruits, Vegetables, Whole Grains Olive oil, Beans, Nuts, Legumes, Seeds, Herbs and Spices
Base every meal on these foods
Be physically active; Enjoy meals with others
Illustration by George Middleton

FIGURE 8-1: The Mediterranean Diet Pyramid.

Although many of the recipes, ingredients, and traditions celebrated in the Mediterranean diet have been around for centuries, they're easily adaptable — no fads, special "diet" foods, or modern technology needed to achieve successful results, and no formulas, exchanges, or point systems to master.

In addition, you don't need a nutrition label to determine what fits into the lifestyle. Centered on healthful, whole foods eaten in moderation, sticking to the Mediterranean diet becomes second nature. Even if you want to enjoy other types of cuisine from outside the region, following the Mediterranean Diet Pyramid will help you remember which foods to eat and when.

American and international scientists and doctors, who were intrigued by the number of elderly people living with lower rates of illness and disease in the region, have been researching the Mediterranean diet for more than half a century. Today, large well-designed studies and clinical trials are demonstrating its effects. Following the diet has thus far been linked to

- Preventing and reversing diabetes
- Preventing heart attacks and strokes
- Improved mental capacity
- Reversing the symptoms and reducing the incidence of Parkinson's and Alzheimer's diseases
- Longevity
- Reduced inflammation
- Reduced risk of death from heart disease and cancer
- Preventing cancer and inhibiting tumor growth

The first big study confirming the benefits of the Mediterranean diet was published in the *Archives of Internal Medicine* in December 2007. It showed a significant reduction in deaths from all causes. More recently, in a study published in the *Annals of Internal Medicine* in January 2014, patients who followed a Mediterranean diet supplemented with extra-virgin olive oil had a significant reduction in the onset of diabetes compared to a control group who were just given advice on a low-fat diet. Another study, published in *Diabetologica* in December 2013, confirmed the advantages of the Mediterranean diet. These are just a few of the many studies pointing to the effectiveness of the Mediterranean diet in preventing or managing diabetes.

One impressive randomized controlled study called the Predimed Study of 7,447 people reported in 2013 in the *New England Journal of Medicine* that high-risk heart disease subjects were 30 percent less likely to suffer from heart attacks, strokes, and death if they adhered to a Mediterranean diet rather than a low-fat Western-recommended diet. The results were so dramatic that the study was concluded early because the researchers felt that continuing to test control groups following other diets would be unethical when they had already determined the efficacy of the diet. The benefits of the Mediterranean diet shown in the Predimed Study have particular relevance for people with diabetes. The participants either had existing type 2 diabetes or three other major cardiovascular risk factors (high blood pressure, high cholesterol, smoking, BMI greater than 25, and family history of premature heart disease). There are ongoing studies (the Predimed Plus Studies) that continue to reveal further benefits beyond the conclusions of the original published research.

Another study published in the *Annals of Internal Medicine* tracked the diets and lifestyles of more than 10,000 women in their 50s for 15 years. The results showed that 40 percent of those who followed the Mediterranean diet were more likely to live past the age of 70 without chronic diseases, memory loss, or physical problems. They also suffered fewer strokes and were less likely to die than the control group who simply followed a low-fat diet.

The Mediterranean diet emphasizes the following:

- Communal eating (daily)
- Physical activity and fresh air (as much as possible)
- Larger lunches and smaller dinners
- Homemade food as much as possible
- Plant-based foods such as fruits and vegetables, whole grains, legumes, and nuts
- Basing meals around fresh, seasonal, local produce instead of animal protein
- High-quality extra-virgin olive oil as the primary source of cooking fat and flavoring
- Fresh herbs and spices to flavor foods
- Fresh fish two to three times per week
- Red meat and sweets on special occasions
- Poultry and dairy two to three times a week
- Everything in moderation
- Unrefined sea salt rather than processed table salt
- Alcohol in moderation (5 ounces of red wine daily for all people older than 65 years and 10 ounces for men younger than 65)

To start on this diet without moving to the Mediterranean region, here are some suggestions:

- Decide *who* to eat with before deciding *what* to eat.
- Make sure that most of your meals and snacks consist of fruits and vegetables, preferably unprocessed and whole.
- If you eat bread or cereal, make sure that it's whole grain and artisanal. The same is true for rice and pasta. Many manufacturers now use special heirloom grains, which have less gluten and lower glycemic indexes.

- Skip butter and use olive oil on everything instead.
- Dress your salads with extra-virgin olive oil and lemon juice or good-quality vinegar only. Or use tahini (blended sesame seeds) as a dressing.
- Eat a handful of raw unsalted almonds and a few good-quality olives prior to meals.
- Add lots of fresh herbs, spices, and lemon juice to flavor your foods instead of extra salt and fat.
- Grill or bake fish, poultry, and meat instead of frying or breading it.
- Choose fish such as tuna, salmon, trout, mackerel, and herring. Check with `www.SeafoodWatch.org` to find out the most sustainable and safe seafood options prior to purchasing because the list changes often.
- Try to eat a variety of flavors, textures, and colors in your food each day. When choosing produce, try to "eat the rainbow" as much as possible because different colored items contain different vitamins, minerals, and other nutrients as well as the all-important polyphenols. Enjoy spicy and bitter flavor contrasts especially from herbs and spices as this often denotes good levels of polyphenols.

Refer to *Mediterranean Lifestyle For Dummies* and *Mediterranean Diet Cookbook For Dummies*, both by Amy Riolo (John Wiley & Sons, Inc.) for more information.

Low-carbohydrate diets

Low-carbohydrate diets can reduce the incidence of diabetes and improve control. This shouldn't be a surprise because the excess of simple sugars in a diet are what contribute to the risk of developing diabetes, and carbohydrates are the source of those sugars. However, when talking about lowering carbohydrates, remember that you eat food, not macronutrients. In other words, foods are more complex than their macronutrient content. For example, vegetables comprise mostly of carbohydrates. Fiber is carbohydrate and is important for gut function, microbiome, and reducing the risk of cancer. Strictly speaking, a low-carbohydrate diet may, therefore, imply reducing vegetable intake, which no responsible practitioner should recommend.

Real foods, unlike sweets and sodas, contain not only macronutrients — carbohydrates, proteins, and fats — but also important vitamins, minerals, and compounds like polyphenols that are important not to miss out on for general health benefits. Some descriptions of a low-carbohydrate diet simply mirror a Mediterranean diet by recommending reducing the high-glycemic simple sugars from sodas, processed foods, refined white breads, and tropical fruit. This is a reasonable recommendation as long as it doesn't advocate reduction in whole

grains and other low-glycemic carbohydrates or if there's a suggestion that the reduction in carbohydrates is replaced by foods such as greater quantities of meat or foods with poor-quality saturated fats that may be harmful.

Dietitians and other health professionals may recommend diets based on information provided by respected organizations in diabetes care or by public health bodies. These will often be similar to the Mediterranean diet (which we discuss earlier in this chapter) in approach but may not include all the qualities we're beginning to appreciate and may not be as focused on a pattern of eating that approaches all aspects of good health.

Vegetarian plans

Vegetarian plans have been shown to reduce the risk of type 2 diabetes and to improve all aspects of the disease when diabetes is already present. Increasing the daily intake of green leafy vegetables has been especially helpful.

A report in *Diabetes Care* in 2009 looked at the diets of 60,000 men and women. The mean body-mass index was lowest in vegans (no dairy), higher in lacto-ovo vegetarians (who ate dairy and eggs), still higher in vegetarians who ate fish, and highest in nonvegetarians. The prevalence of type 2 diabetes was lowest in the vegans and rose with the mean BMI so that it was highest in the nonvegetarians. The risk of metabolic syndrome was also found to be lowest in the vegans and rose with increased meat eating. Vegans may need to add additional vitamin B12.

Anti-inflammatory diets

The best diet for diabetes is one that helps with glucose control. Poor glucose control is associated with inflammation, and chronic inflammation is the root cause of many serious illnesses that are linked with diabetes, including heart disease, many cancers, and Alzheimer's disease.

Here, we consider how a diet can be anti-inflammatory. In recent years, a number of authors have published books promoting anti-inflammatory diets. These patterns of eating have focused on specific foods that have been shown to have anti-inflammatory properties.

The good news is that an anti-inflammatory diet can be measured by its Dietary Inflammatory Index Score, and the Mediterranean diet is about as high on this score as it gets. The foods in the Mediterranean diet, in particular the ubiquitous ingredient extra-virgin olive oil, work to reduce inflammation. Other heritage diets may also score well in reducing inflammation because of their use of ingredients such as seaweed, kimchi, quinoa, ginger, green leafy vegetables, and turmeric or other native herbs and spices.

An anti-inflammatory diet can play a very positive role in preventing, reversing, and treating many forms of disease. It can also help reduce the body's sensitivity to pain prevalent in conditions such as fibromyalgia, arthritis, and other illnesses associated with chronic pain. This is particularly relevant, as we discuss in Chapter 5, because diabetes itself and the illnesses that are complications of poorly controlled diabetes are diseases of chronic inflammation.

Proper diet and exercise can help balance the negative effects of some genetic patterns and exposure to environmental factors and toxins that may result in inflammation in the body.

Acute inflammation on the surface of the body manifests itself as redness, heat, swelling, and pain and is usually a temporary and useful response to damage or a threat from external factors that should naturally resolve and heal. But when inflammation persists, is misdirected, or is triggered by recurring harmful factors, it damages the cells in the body and may become chronic and result in serious illnesses, blood clots, and cancers.

Chronic inflammation can be driven by a number of things, including smoking, environmental toxins, a poor-quality diet, and a persistent state of what is called *oxidative stress* — when the chemistry of cells is out of balance, when atoms or molecules called *free radicals* aren't controlled. Free radicals, either from environment or by-products from metabolic processes, are highly reactive and can cause damage to structures in the body through a process called *oxidation* — a chemical reaction that involves them taking electrons from other stable molecules. This can result in a destructive chain reaction and further damage to cell structures and can cause an inflammatory response. If this isn't counterbalanced by internal healing processes, supported by antioxidant compounds found in the healthy ingredients of diet, then chronic inflammation can occur.

Plant compounds called *carotenoids* and *phenols,* or groups of phenols called *polyphenols* can stabilize free radicals by generouslys donating electrons, thereby quenching antioxidant's insatiable appetite to steal electrons from others and suppressing their reactivity. (See Figure 8-2.)

Extra-virgin olive oil, garlic, chilies, fish, tomatoes, green leafy vegetables, green tea, berries, and cherries are all anti-inflammatory foods because they're rich in antioxidant compounds like polyphenols. Eating combinations of these delicious ingredients, along with avoiding foods fried in unhealthy oils, large amounts of red or fatty meat, processed foods, excess alcohol, and simple carbohydrates and sugars from processed bread and pasta can have major health benefits. Diets high in saturated fats, sugar, and an excess of polyunsaturated omega-6 fats from vegetable oils are *pro-inflammatory* — they increase levels of inflammation in the body in contrast to those foods that suppress and control chronic inflammation.

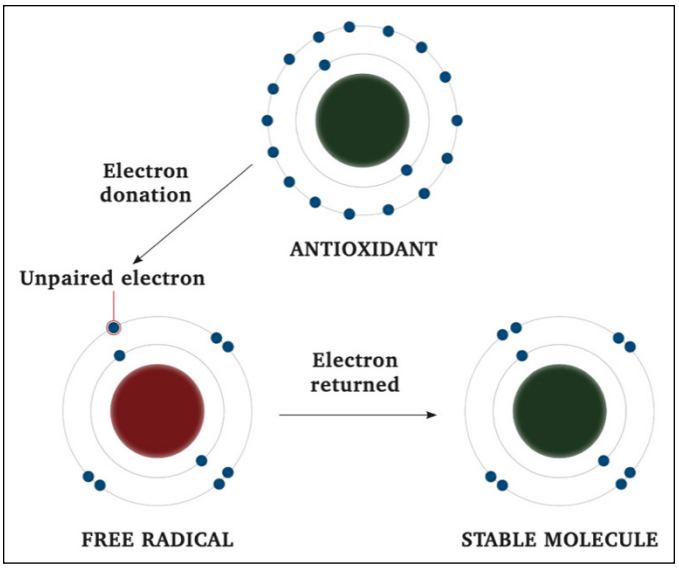

FIGURE 8-2: How antioxidants reduce free radicals.

TIP

Consider shifting your diet in the direction of more vegetables and good-quality extra-virgin olive oil with less animal protein. The benefits of this alone may be huge. Buy extra-virgin olive oil with a little bitterness and pungency that has been harvested early and grown in a naturally challenging environment. This is likely to be one with higher antioxidant polyphenols.

Other Traditional diets from around the world

In traditional cultures, people usually eat specific foods to achieve their health goals or may have foods "prescribed" to them to cure certain ailments. Ginger for an upset stomach, garlic to fight infections, and chamomile to help promote relaxation are all common traditional "medicinals" used to make people feel better. What's important to remember when embarking on any new diet plan is to view food as a friend, instead of a foe. Food, if you allow it to, can improve your mood, your body, your immunity, and your energy. It can also help you balance blood sugar, lose weight, and have more energy.

The Mediterranean diet is perhaps the most studied diet in the world, and the ingredients are familiar to many people in other countries, but other traditional ways of life are also healthily associated with reduced risks of type 2 diabetes, obesity, and other chronic illnesses.

In addition to the Mediterranean diet, traditional heritage diets from Asia, Africa, and the Americas all incorporate healing elements. Many of their dishes were "naturally" balanced to promote health and well-being. In our modern world, where food is often considered bad, "off-limits," or "sinful," it's important to

underline not only the importance of food for survival, but the fact that each naturally occurring food has a different health benefit and set of vitamins, minerals, and other substances that communicate with your body to keep it running well.

Some popular heritage diets include the following:

- Heritage diets from northern Europe are also based on unprocessed whole grain carbohydrates such as oats or rye and root vegetables like beets as well as plenty of oily fish. This Nordic diet is similar in its principles to the Mediterranean diet.
- The Okinawa diet from Japan has also been shown to reduce the risk of diabetes and obesity with fermented foods, seaweed, and local vegetables all thought to play a part as well as the cultural relationship with food.
- Kombucha, originally from China, is another fermented food from Asia that may improve glycemic control and support a diverse gut microbiome, which we know to be important for weight and diabetes.
- In contrast, the increased consumption of white rice in some countries has been associated with an increased risk of developing type 2 diabetes. People who eat the most white rice (three or four serving each day) are at 1.5 times the risk of developing diabetes, and every large bowl of white rice increased that risk by 10 percent.

When considering other heritage diets, there are plenty of opportunities to add healthy ingredients from one to another if the fundamental principles are maintained. Cultures in the past have incorporated ingredients from other traditions. The peoples of the Mediterranean welcomed the spices from the Far East, garlic from India, lemons and pomegranates from Persia, and, of course, tomatoes, now synonymous with the diet, were a relatively recent addition from the Americas.

Considering Extra-Virgin Olive Oil, Alcohol, Additives, and Sweeteners

It's worth expanding upon about some poorly understood or controversial elements to diet. Extra-virgin olive oil is often underestimated in its pivotal role at the heart of the Mediterranean diet with beneficial effects on diabetes and weight management. There is much debate about the health or harm from alcohol, additives are often the hidden poisons in our foods, and sweeteners are promoted as a quick fix for weight loss. This section explains what you need to know about each one.

Extra-virgin olive oil

Because olives and olive oil are a common denominator in the countries surrounding the Mediterranean, they're often the ingredients that are analyzed in Mediterranean diet-based research. Olive oil includes antioxidants such as vitamin E, carotenoids, phenols, and polyphenols such as hydroxytyrosol and oleuropein (known for their antioxidant, anti-inflammatory, and antibacterial effects).

Antioxidants are important in the prevention of aging. Oxidation is part of the complex manner in which cells age. Cells in those following olive oil-rich diets have been proven to be stronger and more resistant to oxidation and therefore age more slowly. The Mediterranean diet's positive effect on longevity is accredited to its high antioxidant content. Extra-virgin olive oil (olive oil that hasn't been refined or industrially treated) is particularly rich in antioxidants, which protects against damage from free radicals and against the formation of cancer.

Consuming high-quality extra-virgin olive oil on a regular basis can help prevent heart disease, lower cholesterol, improve rheumatoid arthritis, and reduce the risk of developing Alzheimer's disease, diabetes, and various types of cancer. Further, various studies have shown that olive oil or an olive oil-rich diet

- Can protect against some malignant tumors
- Reduces the risk of breast, colon, and bowel cancer and the incidence of melanoma
- Prevents the formation of blood clots and lowers the levels of total blood cholesterol (believed to be responsible for the low incidence of heart problems in countries where olive oil is the main cooking fat)
- Boosts the immune system against the negative effects of toxins, microorganisms, parasites, and other foreign substances
- Can improve calcium absorption in the body and prevent osteoporosis
- May prevent memory loss in healthy elderly people
- May lead to less risk of developing rheumatoid arthritis
- Decreases the glycemic load of a meal and also increases insulin sensitivity

Best of all, topping nutritious foods such as vegetables, plain Greek yogurt, and seafood with extra-virgin olive oil coaxes even more nutrients out of those same foods.

Alcohol

Alcohol in excess causes harm to health. Many people choose not to drink alcohol at all for personal reasons. It's not a nutrient because it isn't essential for life; however, certain alcohol drinks in moderation may contain bioactive compounds that can benefit health.

Alcohol, especially in the form of red wine, always consumed in moderation and with food, can be a good source of bioactive polyphenols called *procyanidins,* which may reduce the risk of heart disease. More than a small glass or two each day, however, can result in interference with glucose metabolism and risk hypoglycemia, especially in people who are taking insulin. Weight gain, increased risk of some cancers, and liver disease are all significant hazards when any form of alcohol is consumed above recommended levels.

The key is to drink alcohol as they do in the Mediterranean: in company, in moderation, and during a meal.

Food additives

The truth is that many food ingredients are newly invented. The increase in processed convenience foods designed to look appetizing and to have a long shelf life has resulted in lists of additives that aren't food at all. Despite government regulation, there remain concerns that some of these chemicals may have unknown harmful effects. For example, some researchers believe that preservatives such as sodium nitrite in its form in processed meats may increase the risk of cancer and that stabilizers and emulsifiers may have a negative impact on gut microbiome, which is so important for so many aspects of health.

The healthiest diets are those with few or no processed foods, and certainly vegetables and fruits in their natural form are unlikely to have any added ingredients. However, even products that may claim to be healthy may not be as "clean" as the front label implies. It's always advisable to read the nutrition label to see exactly what you're eating.

Artificial sweeteners

When it comes to diabetes, fear of the "danger" of sugar in the diet has led to a vast effort to produce a compound that can add the pleasurable sweetness without the liabilities of sugar. Interestingly enough, despite the availability of a number of sweeteners, some containing no calories at all, the incidence of diabetes continues to rise.

Sweeteners are divided into those that contain calories and those that don't. Fructose, xylitol, sorbitol, and mannitol are all derived from plants. They have been designed to provide sweetness without raising blood glucose levels to the same degree as table sugar. Although "natural," these compounds where they occur in fruits and berries are part of a matrix of fiber and are present with other nutrients and bioactive compounds that may be advantageous to health. Saccharin, aspartame, acesulfame, sucralose, and stevia are other sweeteners that are promoted because they satisfy the desire for sweetness yet don't adversely affect blood glucose.

A review of the effects of sweeteners on the gut microbiome published in *Advances in Nutrition* in 2020 expressed concerns that at least some sweeteners may actually increase the risk of heart disease and type 2 diabetes but concluded that more studies were needed to establish whether this is the case.

Some claims suggest that sweeteners may, even when they contain zero calories, contribute to weight gain, though the mechanisms for such a proposed effect haven't been identified. There's also concern that rather than satisfy an appetite for sweetness, they may drive further cravings. To suggest that the sweetness of sugar is addictive is to enter a highly controversial debate, with some commentators claiming that sugar is "as addictive as opiates" and other suggesting comparisons like this to be unhelpful. Meanwhile, the food industry has spent considerable amounts of time and money in past decades finding the "sweet point" to market processed products that are high in refined sugars.

In the Mediterranean diet, sugars are enjoyed in fruits or with the occasional use of a small amount of unprocessed honey in a dessert. This is compatible with low rates of obesity and type 2 diabetes without the use of artificial sweeteners. Whether we call a desire for sweetness an addiction or not, what is clear is the benefit of gradually moving to a diet like the traditional Mediterranean diet with very little added sugar; no artificial sweeteners; and a highly satisfying, tasty, and healthy lifestyle.

IN THIS CHAPTER

- Nourishing your mind, body, spirit, and emotions
- Choosing and making foods you enjoy
- Navigating the different roles of nutritionists, dieticians, and health coaches

Chapter 9

Nourishing Yourself: Healthful Eating and Lifestyle Strategies

Nourishment isn't confined to the food you eat. Diet is just one way in which you can create your very best health and well-being. Nourishing yourself can be a daily pleasure that you continuously partake in. In addition to what you eat, the thoughts you think, the dreams you allow yourself to believe in, and the positive emotions that you experience all can nourish you. Nourishing the mind, spirit, and emotions can even enable your body to digest food better and absorb more nutrients.

In this chapter, you find out all you need to know to truly nourish yourself on all levels. When your mind and emotions are in a good place, eating well and feeling good become much easier and more pleasurable. You can make your diet work for you, not only to improve your diabetes and control your blood glucose but also to have an improved quality of life.

Considering How Your Thoughts and Emotions May Affect Your Health

Practitioners of integrative medicine use a therapeutic approach based on the premise that we are more than our minds and bodies; we are also systems of energy and consciousness. We can use our thoughts, emotions, and energy to affect our entire well-being. For example, have you ever suffered from a physical symptom and when distracted or busy, you don't notice it as much? Or have you ever had a physical symptom show up after you've been really upset about something? If so, you're normal. Our bodies speak to us and give us feedback at all times. In fact, certain thought patterns and beliefs, whether conscious or not, can cause us to manifest physical ailments.

Sometimes, a combination of factors lead to illness and disease, but by adopting a mind-body approach to healing along with conventional modes of treatment, patients can often achieve deeper and more lasting results. Once you've been diagnosed with diabetes or other health issues, and you have a plan of treatment, it's worth exploring the metaphysical aspects of the condition to see whether they could be addressed. Proponents of mind-body therapy and other types of energy healing believe it's an easy and noninvasive way of dealing with illness and associated symptoms.

Unprocessed emotions, childhood trauma, unresolved conflicts, feeling trapped in various areas in your life, histories of abuse, injustices, and separation from loved ones can all be reasons why your psyche may be resistant to enjoying a fulfilled and healthy life. Discussing, working through, and transforming these internal conflicts with the proper mind-body therapist, psychologist, psychiatrist, coach, or healer who has experience in your particular experience can make a huge difference in your happiness and your health.

TIP

Some doctors and people with diabetes may be skeptical about considering integrative medicine techniques as part of the approach to care. Talk of "energy," "the metaphysical," and "spiritual" may sound outlandish and even threatening to some, but we all have energy and subconscious elements to our lives. Many practices, some of which derive from cultures that may at first seem foreign to those who have experienced only a Western medical model of treatment, can be considered from an evidence-based approach and have been shown to be effective.

Integrative techniques have become more familiar to many people, and some of the best treatment centers in the world combine acupuncture, massage therapy, meditation, and mindfulness with medical therapies. Just as we advocate for the approach to your care throughout this book, be sure that your therapist is well qualified in their field, has an excellent reputation, and that you ask questions and fully understand the rationale and proposed outcomes of the therapy.

Nourishing Body and Spirit

The nutrition field focuses on food, and until recently, the mind-body-spirit connection was left out of the equation. People don't just consume; they eat. People also consume what they listen to, what they watch and read, and what they think. For this reason, it's a good idea to take stock of what you ingest to make sure it will do your body and entire being good.

Many people agree that eating junk food on a regular basis is a bad idea. Listening to fear-inducing radio programs, watching violence on television, and thinking hurtful thoughts do just as much damage. If you want to perform at optimal levels and enjoy good health, start by making a commitment to truly nourish yourself with the thoughts, sounds, feelings, and foods that will do your entire self good.

Nourishing your mind

Mente sana, corpo sano is a popular Italian saying meaning "healthy mind, healthy body," and it's based on a philosophy which dates back to ancient Rome and Greece. The mind-body connection to health is undeniable yet often overlooked in modern medicine. While eating better food will improve your health, it can only go so far if your mind isn't being well nourished as well.

Sometimes past trauma, unresolved mental issues, and stressful periods in life can cause you to be affected in a negative manner. You should consult mental health professionals to help deal with specific concerns when appropriate. Here are some other ways to nourish your mind:

- **Think positive thoughts whenever possible.** Some people have thought patterns that they're not aware of, or that were learned from others, and thinking differently may seem like a betrayal, but it isn't. Learn to replace each "Isn't it too bad that . . ." with "Isn't it great that . . ." and each "I hate . . ." with "I love . . ." Count your blessings morning, noon, and night. When you first wake up in the morning, look for reasons to feel good. Keep a journal of things that get in your way, and if you can't change those things, take your attention off them, and put it back on what you love and what makes you feel good, no matter how difficult it may be. In the long run, you'll retrain your mind and body to crave feeling good.
- **Practice gratitude:** Writing down 10 things that you are truly grateful for in your journal is an instant mood booster that you can do anytime. It's said that a grateful heart is a magnet for miracles. If you wait until life is perfect to give thanks, you deprive yourself of good-feeling thoughts that are integral to your

health. Even during moments of stress or anxiety, you can pause and reflect upon the simple things that make your life better. A warm blanket or a comfortable sweater, nourishing foods, and the ability to read are often taken for granted but add great depth and joy to our lives.

- **Meditate daily.** YouTube and other sites have plenty of free guided meditations available. Find the ones that soothe you the most, and dedicate ten minutes or more each day to doing them. Meditation helps you focus, concentrate, and feel more positive while reducing stress and cortisol levels that lead to weight gain.
- **Treat yourself to sweet words.** Language specialists claim that the sweetest phrase in the English language is "I love you." Tell yourself that you love yourself daily. Remind yourself that you love various parts of your body and mind for what they do for you and allow you to do. Give thanks to your health for keeping you alive. Tell your friends and family that you love them and affirm "I love . . ." with all the things that you do love often. Hearing these sweet words is like an elixir of calm and well-being for your cells that will have a positive impact on your health.
- **Listen to music.** Classical music has been proven to aid concentration and boost brain power. There are also many healing sound frequencies said to promote healing and well-being. You can find them and listen them on YouTube. It seems that plants also respond to sound in their environments. Some winemakers in the Barolo area of Italy continuously from loudspeakers (even underground) because they believe that the music mimics tones in nature and therefore has a positive effect on the vines.
- **Luxuriate in the sounds of nature.** Listening to the sound of ocean waves, light rain, and birds singing can promote feelings of well-being and peace.
- **Take advantage of "The Blue Effect and "The Green Effect."** Just 10 minutes of exposure to greenery (trees, shrubs, plants) and water (a creek, lake, pond, river, sea, or ocean) can improve your outlook and disposition.
- **Learn something new (that you enjoy).** This can boost your brain power and create a sense of accomplishment.
- **Create something beautiful.** Whether it's a garden, a recipe, a clay pot, a painting, a drawing, a poem, a sewn or crocheted piece of fabric, a song, or something that you've built — creating is a great boost for the psyche and a stress reliever.
- **Eat brain-nourishing and mood-boosting foods:** Foods like fish, walnuts, flax seeds, extra-virgin olive oil, blueberries, avocados, and rosemary are great fuel for the brain.

Nourishing your body

Nourishing your body is easy and natural. Nowadays there is so much diet information available in advertisements and media that knowing what to do can be confusing and intimidating. By sticking to a few basic rules and eating the most nutrient-dense, fresh food possible, you will be able to feel better and maximize your performance while enjoying yourself in the process. A common misconception is that eating healthfully deprives you of joy and flavor, but with the strategies we share in this chapter and the next and in the appendix, you'll be able to enjoy the best of both worlds.

Here are some basics guidelines for eating healthily:

- Commit to the 90-10 rule — eat good-for-you foods most of the time.
- Build your meals and snacks around produce. Aim for 9 to 12 servings of fresh fruit and vegetables per day.
- Make sure that each meal or snack that you eat contains the three macronutrients: a healthy fat, a quality carbohydrate, and a lean protein.
- Choose the most nutrient-dense foods possible — leafy or bitter greens over iceberg lettuce, good-quality extra-virgin olive oil over vegetable oil, and salmon or sardines instead of a hamburger (see the appendix for more ideas). This will give you the most nutritional bang for your buck.

  Familiarize yourself with the nutritional guidance in this book and make lists of the foods that you can and should be eating and enjoy those most often.
- Develop techniques (see Chapter 10) to make buying and preparing good food easy.
- Avoid sodas, sugar and fake sugar, prepared and processed foods, and fast foods as much as possible.
- Eat local, organic foods and those without additives as often as possible.

Nourishing your spirits and emotions

We are more than our minds and bodies; we are systems of energy and consciousness. When you fuel your spirit with gratitude, care, love, and positivity, you are setting yourself up for success in all areas of your life.

In many modern societies, the words *emotion* and *emotional* conjure images of someone with negative emotions, but that is not the case. We are meant to be enriched by our emotions, and the more we do so, the healthier we will be. There

is another big misconception regarding the term *emotional eating*, which is often used to describe someone who eats unhealthful foods or overeats to compensate for negative emotions. The truth is that you can also eat in a way that promotes positive emotions. Cooking and sharing foods with others is an excellent way to lift your spirits, and having diabetes is not a barrier to those traditions.

The following are some simple tips to nourish your whole being.

- **Talk with a confidant.** In the blue zone areas of the world where people are known to live much longer than average and have a high quality of life, one key factor of longevity is having a few close confidants to share experiences with.
- **Listen to or watch only things that make you feel good.** You have as much control over what you put into your consciousness as what you put into your body. Before choosing a program to watch, ask yourself, "Is this good for me? Will it put me in a good mood?" If the answer is no, don't play it. On the other hand, if there are things that always make you feel good to listen to or watch, spend more time with them.
- **Laugh as much as possible.** Documented evidence of humor therapy being prescribed to surgery patients dates back to the 14th century. Laughter strengthens the immune system, boosts mood, diminishes pain, and lowers stress while increasing oxygen intake. Watch a comedy, listen to your favorite comedian, joke with friends, and listen to recordings of people laughing on YouTube to take advantage of this benefit.
- **Take a 10- to 20-minute nap.** Even a nap as short as 10 minutes has been proven to increase productivity, increase creativity, and lower stress while increasing positive emotions. If you have difficulty falling asleep quickly, you can use breathwork techniques, listen to soothing music, or even use a guided meditation to enable you to take advantage of the benefits of napping.

Nourishing the senses

In addition to your mind, body, and spirit, nourishing your individual senses can offer pleasure and help you make your meals and your days more enjoyable. Cooking is a great way to nourish the senses because when you immerse yourself in the process, your sense of smell is rewarded with the aromas of the food cooking, your eyes benefit from the colors of the fresh produce, your ears appreciate the sounds of sizzling and sautéing, your hands are stimulated by the feel of what you're preparing, and your sense of taste, of course, benefits the most.

Cooking isn't the only way to nourish your senses. Following are some other examples of ways your senses can be nourished:

- The sounds of birds chirping is extremely therapeutic, as is hearing pleasant words, a beautiful melody, or the voice of a loved one.
- The sense of touch is stimulated with fabrics and textures that feel good, holding someone's hand, working with your hands on something that you enjoy, and hugging others.
- The sense of sight is boosted when you look at things that make you feel good. Gazing into nature — whether it's greenery or a body of water — and looking into the eyes of a loved one can make you feel better.
- The sense of taste is in for a treat when you taste the foods that you love the most, or even experience something deliciously new. If you treat yourself to the healthful recipes that you enjoy, you'll get additional benefit from them.
- Scents are believed to provoke memories even stronger than other senses. The aroma of a loved one's perfume as well as scents like citrus and frankincense are mood boosters. Other scents, like lavender, are used to help evoke relaxation. Aromatherapy is a wonderful addition to your daily routine.

One of the often-overlooked benefits to nourishing your senses is the way in which they satisfy you. When all your senses are occupied and fulfilled, it takes the attention away from hunger and cravings. One of the reasons that people overeat is for the sensory pleasure. When some of the attention is placed on other senses, and their satisfaction is also nurtured, you need less food to "fill up."

Nourishing your social communities

The ritual of eating communally is both important and anticipated by many people around the world. Sharing meals with others and physical activity are the base of the Mediterranean diet (see Chapter 8 for more).

In areas where the Mediterranean diet is the way of life, people go out of their way to plan meals together, which has been linked to increasing longevity, eating and digesting better, and eating less. Throughout the region's history, eating alone was frowned upon. Even today, most people in the Mediterranean find it unpleasant to eat alone. Fortunately, in many places, work and school schedules revolve around mealtimes. When they don't, families change their schedules to be able to eat together — at least for one meal per day. We highly recommend seeking out family, friends, coworkers, and neighbors with whom you can enjoy meals with more often.

Researchers who studied this remarkable longevity of the residents of Sardinia (who are more likely to live past 100 than U.S. residents) found that daily communal (family-style) eating was commonplace and likely contributed to the overall well-being of residents. The researchers concluded that there's something extremely satisfying and comforting about knowing that, no matter how difficult life gets, at mealtime, you'll be surrounded by loved ones. This adds a deep sense of psychological security, which, in turn, has a positive effect on health and happiness.

TIP

In a world where stress, loneliness, and depression are consistently on the rise, eating together can be a conscious and deliberate act made to enjoy both pleasure and health at the same time. Here are our suggestions for making communal eating a part of your life, even if you live alone:

- Make your health and well-being a priority.

  Recognize the psychological and health benefits of eating communally.
- Commit to eating communally some of the time, until it becomes a habit.
- Schedule breakfast, lunch, or dinner with people whose company you enjoy.
- Break the rules of who gets to eat together. You don't have to be married or in a romantic relationship or part of a family to enjoy regular meals with someone, nor do you need to make a meal a date. You can have eating partners just as you have running or tennis partners and people you carpool with.
- Challenge your preconceived ideas of what can be eaten communally. Many people feel that unless they're eating a really nice meal, it's better to eat alone, but this couldn't be farther from the truth. You'll gain health benefits by eating with others, regardless of what you eat.
- Set up communal eating schedules with coworkers — or those who live in your building or neighborhood, if possible.
- If you must eat alone often, let technology be your friend. Try having a video call with someone at mealtime. You can let them know the health benefits and why you're starting this tradition. It may seem weird at first, so you can try it with coffee or tea. For example, tell new friends, "I'll make coffee and then call you." They may enjoy the touch of ceremony that it adds to your conversation. After a while, "eating together" virtually becomes easier, and your brain gets the psychological benefits of having someone to dine with.
- Begin a food journal and write down who you're going to eat with to emphasize the importance of the new idea.
- Enjoy this opportunity to eat communally. Look at it as a way to get more out of life, invest in your health, and enjoy yourself more.

SEVEN TIPS TO MAKING A RESTAURANT DINNER A HEALTHFUL EXPERIENCE

Communal meals often take place at a restaurant. When you're eating out, you can still enjoy a meal that supports your healthy lifestyle by keeping the following tips in mind:

- Drink a large glass of water 10 minutes before you have your meal so you feel more full.
- Check the menu before you go to make sure there are entrées that work for your diabetes.
- If there is a delay in getting your table, ask for some carrot sticks and celery until you can be seated.
- Don't drink any wine until you can have some food with it.
- Consider splitting your entrée with another guest to reduce the number of calories and carbohydrates.
- You can have dessert, but share it with others at the table and try to be satisfied with a bite or two.
- If you take insulin, wait until you get food containing carbohydrates, protein, or fat before taking your injection.

Enjoying Your Food

Forcing yourself to eat foods that you don't like because someone said that they're good for you isn't an effective diet or weight management plan. In fact, eating what you like and enjoy will help keep you on track with your overall health. The secret is finding foods that you like and also happen to be good for you and in preparing foods that you never knew that you liked in ways that makes them appealing to you.

We created the appendix in this book, as well as Chapter 10, to help you eat good foods that are both good for you *and* tasty. Once you start identifying which foods do your body the most benefit and discovering delicious ways to enjoy them, eating well, in all senses of the word, will be a pleasure. Many people, once they find how enjoyable healthful dishes can be, wish that they had discovered them sooner.

Figuring out which foods are most beneficial for diabetes patients

In general, plant-based foods offer the most benefit to those seeking optimal health. For those with diabetes, protein, fiber, and antioxidant-rich greens such as broccoli, dandelion greens, spinach, kale, watercress, asparagus, Brussels sprouts, and collard greens should be present in as many meals as possible. Cauliflower, avocado, peppers, green beans, and all green leafy vegetables are also great additions.

A serving of lentils and chickpeas or other dried beans offer protein, fiber, and healthful carbohydrates with no cholesterol and are very low in calories. A serving of beans or legumes per day is a great addition to the diet. Lean proteins such as fish and chicken are also good sources of protein.

Almonds, walnuts, olives, extra-virgin olive oil, flax seeds, and plain full-fat Greek yogurt (which contains inulin, a substance shown to balance glucose levels) offer healthful fats and protein. Full-fat plain Greek-style yogurt also contains the three macronutrients in one food, making it a quick and easy snack or light meal replacement on the go.

Whole grains and nonstarchy proteins are the best sources of carbohydrates for someone with diabetes. Fresh basil, citrus, berries, and tomatoes are believed to be particularly beneficial because of their vitamin and mineral content.

Discovering enjoyable meals that will have you feeling your best

Throughout the Mediterranean region, and in many other places in the world, food is seen as a friend and ally. In addition to being necessary for existence and a source of joy, food can be a form of diplomacy, a part of cultural expression, a science, and an artform. For many people in the United States, however, food is viewed as an enemy.

Many people who need to lose weight mention "not being able to look at food" because they're on a diet. But it is precisely that mentality that sets people up for failure at the table.

Food is meant to be shared and enjoyed to the fullest. The more you enjoy the nutritious food you eat, the more fulfilled you'll feel, and the fewer cravings you'll have. The pleasurable aspect of eating well also has psychological benefits. The key lies in identifying and choosing foods, like the ones we discuss in the

preceding section, that are best for you. If you're on a diet or concerned about leading a healthful lifestyle, you should think about food often.

Having an idea of what you're going to prepare and eat next will help you stay on track with your lifestyle plan. A rule of thumb is always to make a mental note of what you'll eat for the next meal before you finish the one you're currently eating. Many people enjoy making menus and knowing in advance what they'll eat and when, so they make plans for several days or a week at a time. Planning meals provides the psychological benefits of being assured that good-for-you food is within reach, but it also helps you save time and money. Chapter 10 gives tips and strategies to make your own meal plans and implement them with ease.

Understanding the Role of Nutritionists, Dietitians, and Health Coaches

Registered dietitians, nutritionists, and health coaches can be helpful resources when planning which dietary plan is the best for your body, preferences, and lifestyle. Medical doctors in the United States aren't trained in nutrition (unless they earned additional degrees on their own), so they alone won't be able to give you the complete nutritional guidance that you may need.

Depending upon where you live in the world, the various types of practitioners have different licensing and education certification requirements. While some people use the terms *nutritionist* and *dietitian* interchangeably, these career paths have distinct differences. For example, those who want to describe themselves as "registered dietitians" have fare more regulations in place versus "nutritionists." What the two paths have in common, however, is that those who pursue these fields have a passion for using their understanding of food and diet to enact positive change in the overall health of their clients. We describe each role here:

- Registered dieticians (RDs) are sometimes called registered dietician nutritionists. In many states, only an RD can counsel individuals regarding specific diet plans. In the past, RDs could be involved with diagnosing and treating medical conditions, which is known as Medical Nutrition Therapy (MNT). However, nowadays certified nutrition specialists also provide MNT. This type of medical care by an RD is sometimes covered by insurance, including Medicare Part B for certain conditions which includes diabetes and chronic kidney disease.

  Both RDs and certified nutrition specialists can also teach people how to use their glucometers or continuous glucose monitors and also explain lab results and help patients understand why certain medications and supplements have been prescribed.

TIP

At the time of this writing, in the United States, some states don't license nutritionists or dieticians. Some license both. Medicare and many insurance companies pay for visits to see a dietician or nutritionist for diabetes. Check with your individual plan to see if this applies to you.

- Clinical nutritionists analyze a person's diet and medical history to determine how their diet can impact their health, prevent disease, or minimize the symptoms of a chronic illness.
- Health coaches can be like professional accountability partners who help and guide their clients to make sustainable lifestyle changes to meet their goals.

If you want guidance addressing your specific needs, seek out the specialists in your area who meet your needs. Ask your medical team for referrals, and contact your insurance company to find out about which types of services they cover.

IN THIS CHAPTER

- Following and enjoying your new eating plan
- Getting help when you need it
- Putting it all together — from plan to plate

Chapter 10
Practical Tips for Success in the Kitchen and at the Table

This chapter describes how to put the nutritional ideas in Chapter 9 to good use in your daily life. It also shares tips and techniques to easily recreate the recipes in the mini-cookbook in the appendix.

In this chapter, we share fun and easy strategies for boosting nutrition and flavor in your kitchen and at the table. With tricks like these up your sleeve, enjoying a healthy lifestyle is within reach.

Starting Your New Eating Plan with the Right Mindset

When you start a new eating plan, you may first think of the downsides and what you may have to give up. However, if you pivot your thought process to think of what you have to gain, the effort becomes much more enjoyable. Increased energy,

"new" good-for-you foods that you enjoy, a better mental outlook, and even improved blood sugar levels all produce feelings that outweigh the fast-fleeting pleasures of junk food. The more good choices you make, the more differences you'll see and feel.

By sticking to a good-for-you nourishment style, you'll soon reap rewards that you never imagined, cravings for unhealthful foods will diminish, and you'll be inspired to continue eating with pleasure and health in mind.

Being realistic about goals and time constraints

As with any type of new activity, developing and following a new eating plan requires time, effort, dedication, and energy. While the trade-off is well worth it, some people can feel derailed and give up if they don't put the proper planning and thought into their new lifestyle choices in the beginning.

Here are some things to consider when starting a new meal plan:

- What are your goals? Do you want to lose or manage weight, balance blood sugar, have more energy?
- Why do you want to be healthy?
- What do you love the most about eating?
- Which foods do you enjoy the most?
- Do you have time to prepare food daily? If so, when and how much time? If not, do you have time once week to prepare food? If so, when and how much time?
- Do you enjoy cooking, and, if not, are you willing to learn to enjoy it?
- Do you, or anyone else who eats with you, have additional food allergies or restrictions to consider?
- Are you willing to take responsibility for the foods that you eat and the way that you nourish your body in other ways?
- Will you dedicate time to make positive nutrition a priority in your life?

You may never have considered some of the questions in the preceding list, but they're all important to think about. Once you decide that you're interested in changing the way that you eat, we recommend giving yourself a week to really ponder these questions and write down the answers, perhaps in a journal (see the next section). Give yourself a day or two to really consider each question and how

it fits into your life. Write down any obstacles that may come to mind throughout the day because those thoughts will prevent you from achieving your goals later on.

If, for example, you identify why you want to eat better and what you like but then feel that you don't have time to perform the proper tasks to make it happen, that is an obstacle. Maybe you want to make the right choices but someone else in your home makes it difficult for you to eat healthfully. You may want to cook foods from scratch because you believe it's better for you but find it quicker and less expensive to buy junk food, fast food, or prepared food. Don't be embarrassed by the obstacles or resistance that comes up for you. This is just your brain's way of trying to protect you from being disappointed in yourself, and it's natural.

Keeping a journal

Combining an eating and glucose journal with a gratitude journal is a powerful way of both motivating yourself and collecting information that will help you progress even further. When you wake up, or when you go to sleep, make it a point of writing down ten things that you're grateful for and why. Whether you're thankful for a warm blanket to keep you comfortable while you sleep, the vision that enables you to participate so fully in the world around you, or the ability to taste food and the joy that comes from doing so, you'll send positive thoughts throughout your body, which will help you digest food better, reduces stress, and make better choices at the table.

You'll also want to write down the following:

- What you ate for breakfast, lunch, dinner, and snacks, and at what time
- If it applies to you, what your glucose monitor readings were before and after eating
- Whether you noticed any physical symptoms of blood sugar imbalances at any part of the day (mood swings, extreme fatigue, cravings)
- Whether you feel particularly good at any part of the day and, if so, what you think caused it
- Which foods/meals you enjoyed the most
- Whether you had any obstacles getting good-for-you food at different times
- Any exercise you did throughout the day
- Whether you felt any particularly good or bad emotions

TIP

As part of this exercise, consider how you can "milk" the good emotions to keep feeling them more. Is there a different perspective that could make you feel better about the things bothering you, and if not, can you "let it go" for the sake of good health?

Considering costs

One of the biggest perceived obstacles to eating well is cost. Modern multinational ad campaigns have told us that we can save money and time by purchasing packaged foods and fast foods. Supermarkets sell rotisserie chickens at a lower cost than the cost of a raw chicken, and you can get really cheap fast food at times. But that is just a fraction of the picture, not the whole scenario.

The truth of the matter is that you can feed a family of four delicious and nutritious diabetes-friendly food for less money than it costs to purchase a very unhealthful, ultra-processed "meal" that will negatively affect their physical and emotional well-being. At the time of writing this book, a fast-food "meal" deal (this means the cheapest available because many cost more) in the United States is $5.99 per person, which works out to just under $24 for four people. Our intent is not to shame fast food in any way, and there are times when it may be appropriate and can even be enjoyed, but if you eat it daily as an alternative to healthful options, it will be very problematic to your health.

Many meal options, including many of those in this book, will not only *not* harm your body but will actually also *help* it heal In addition, at the time of writing this book, each of the breakfast, lunch, and dinner options in the mini-cookbook in the appendix actually cost less to make than a similar meal from a restaurant. That said, food prices continue to soar in our continued state of global inflation, so here are some ways to save money while eating as well as possible:

- Keep your pantry stocked with bulk grains, legumes, and good-quality extra-virgin olive oil (EVOO) that you can purchase when they're offered on sale.
- Purchase seasonal produce (what's in season always costs less and is better for you).
- Grow your own herbs in a windowsill and/or produce in a garden if possible.
- Repurpose your leftovers into additional meals.
- Use pockets of time to cook from scratch.
- Make "base" recipes (bread crumbs, croutons, salad dressings) from scratch. See the appendix.

Swapping store-bought with homemade: Every little bit counts

The Italian saying *tutto fa brodo* literally means "everything makes broth," but we can interpret it as meaning "every little bit counts." When we're speaking about success in the kitchen and with nutrition, every little bit goes a long way. Just by swapping out simple daily ingredients like bottled sauces and dressings or canned stocks with homemade ones, you'll save money and gain nutritional benefits.

Here's why:

- Store-bought sauces and dressings often contain high amounts of sodium, sugar, and fat (or their chemical equivalents) and therefore add unnecessary salt, sweeteners, and other ingredients that you don't need in your diet.
- By making your own sauces and dressings, you add flavor and health benefits into your diet.
- Sauces and dressings, when made authentically with good-quality extra-virgin olive oil, vinegars, and other antioxidant-rich ingredients such as garlic, tomatoes, and herbs, give you a lot of nutritional bang for your buck and taste much better without the negative side effects.

Check out the appendix for base recipes needed to not only run your kitchen like a pro but to also save money and gain better health while doing so. Keep them handy to make the other recipes in the appendix and to create the recipe formulas at the end of this chapter.

Asking for Help When Needed

Maintaining a new lifestyle takes time and dedication. Sometimes it also requires you to step outside of your comfort zone and let others know how they can help you achieve your goals. Other times, it may require relying on some new resources, such as books, apps, dietitians, or coaches, to help you along the way.

Finding resources to help facilitate change

If you find that financial reasons make it difficult to cook or purchase nourishing foods, seek out services in your area that offer assistance. In the Washington, D.C., area, for example, free meal services are available that provide the appropriate diet-friendly food for people who can't afford it or are unable to physically cook for themselves. Many religious and spiritual organizations offer services like this as well.

If you have physical limitations to cooking nourishing meals for yourself, try asking a friend or loved one for assistance. Often times people want to help, but don't know how. When you ask for assistance, you offer others the opportunity to feel good about being able to help you. They may be able to make meals in advance so you'll have them on hand when needed. If you're able to afford it, you could always hire a personal chef or meal delivery service that could help lighten your load.

Many people can afford food and know how to cook but have difficulty fitting shopping and prepping into their schedules regularly. A certified health coach can help determine and transform the underlying causes that prevent you from taking the necessary action. A dietitian is helpful in creating specific plans built for your body type, health concerns, and lifestyle that will be easy to adhere to.

FROM THE AUTHORS

Sometimes asking for help is a gift, not only for you but also for the person doing the helping. When I (Amy Riolo) was a teenager, my mom was diagnosed with diabetes, and because she worked, she asked me to prepare healthful meals that met her meal plan each night for dinner. This not only alleviated her from having to do more than she could, but it sparked my passions and led to the very rewarding career that I enjoy today!

Acknowledging weaknesses and overcoming them

Time, money, and the belief that the effort won't be worthwhile are usually at the tip of people's tongues when they explain why they aren't able to achieve their goals. When you identify what you believe gets in your way, stop to analyze whether it's a true obstacle or a perceived one. For example:

- If the issue is "not enough time," look at how you perceive the change that you're trying to create. If you believe that it's important to your health, that you are a worthy individual, and that you can create the results you want, you'll find the time. If you can't, perhaps you believe that it isn't important or that you aren't worthy or capable. You can seek the help of a physician, therapist, counselor, or coach to help you change your beliefs.
- If you truly believe that your schedule is the culprit for not eating better, you could have good food delivered to you and designate specific pockets of time, even if only once a week, to prepare your own food.
- If you can't financially afford to eat well, you may consider seeking assistance from friends, family, food banks, nonprofit organizations, or government programs to supplement your income.

- If you believe that your efforts wouldn't make a difference in your overall health, you can put those thoughts to bed as you read this book. It is medically proven that a proper diet can help prevent, treat, and sometimes even reverse disease. Eating well is the most powerful action that you can take to improve your daily life.

Focusing on what you can do and when

Some people have the ability and opportunity to cook a meal from scratch at the end of each day, or even multiple meals per day. Others may get home late at night and not have the option. With just a few hours per *week*, you can heat healthful and mouthwatering food on a daily basis.

Here's how to make it work for you:

- Decide what you want to eat in a week. Make menus for breakfast, lunch, dinner, and snacks each day (use the recipes in the appendix for inspiration).
- Make a grocery list and decide when you can shop or order the food online.
- Identify a pocket of time when you can prep food (an hour after shopping or the next day) to wash, prep, and cut vegetables; cook base ingredients; and so on.

Once you've done those three steps, you can look at your weekly schedule and determine when you may be able to cook. One of the many different strategies for keeping good, homemade food in your daily life is called "weekend warrior." With this strategy, you set aside a few hours on your day off to actually prep and cook your ingredients.

Once you have your groceries, you can make some base recipes (see the appendix). Those recipes paired with a well-stocked pantry and a few other ingredients mean tasty, healthy, fast food is only a few minutes away!

Knowing the Kitchen Basics

Have you ever been to a fast-casual or open-kitchen restaurant where you could see stations of food set up? In some of these types of restaurant chains, the diner simply walks down the line and puts together a bowl, salad, or plate of food consisting of a type of protein, carbohydrate, and fat. You can recreate the same concept in your refrigerator with just an hour of meal prep. With a little planning and the right ingredients on hand, you can whip up your own stir-fries, pasta

dishes, savory skillets, soups, stews, omelets, and more in less time than it takes to wait for delivery or drive to a restaurant.

Menu planning

It's important to ensure that you have the three macronutrients present in each of your meals and snacks. (Read more about the macronutrients in Chapter 9.) Consuming a combination of the proper portions (determined with help from your dietitian) of lean protein, complex carbohydrates, and healthy fats at the same time will keep your body and mind running at optimal performance.

Meal planning is important because it helps you stick to a plan. It also enables you to make sure that you're getting a variety of nutrients (eating the rainbow), tastes, and texture in your meals. Efficient meal planning means that you're using up leftovers and coaxing the maximum flavor out of ingredients. Many people associate meal planning with menus for fancy dinners or holiday parties, but keeping a menu of your daily lunch, dinner, breakfasts, and snacks, no matter how simple they are, is one of the most important actions you can take to ensure good health.

Starting a pantry

It has never been easier to find great products and fresh produce. If you can't find them at a local farmers' market or grocer, order them online.

Here's a list of items to keep on hand:

- **Baking items:** Active dry yeast, almond flour, baking powder, baking soda, extracts, whole wheat flour, all-purpose flour, 00 flour (or "double zero" flour used to make pasta and pizza dough)
- **Beans and legumes (preferably dried; cans are okay in a pinch):** Brown lentils, green lentils, red lentils, cannellini beans, chickpeas, cranberry beans, black beans, fava beans
- **Herbs (dried):** Oregano, parsley, sage, and thyme
- **Italian specialty items:** Olives, plain bread crumbs, tomato sauce, canned tomatoes, olives, roasted peppers, anchovy fillets (packed in olive oil)
- **Nuts and dried fruit:** Almonds (blanched and raw), chestnuts (jarred or packaged, whole roasted or steamed), hazelnuts, pine nuts, pistachios (shelled), walnuts, dates, figs
- **Condiments:** Extra-virgin olive oil, white balsamic vinegar, balsamic vinegar (preferably *Aceto Balsamico di Modena*), red wine vinegar, white wine vinegar, tahini sauce

- **Dried pasta (whole wheat or gluten-free):** Penne, couscous, and spaghetti
- **Rice and grains:** Brown rice, whole grain rice, basmati rice, barley, cornmeal/polenta, farro, spelt berries
- **Seeds:** Sesame seeds, flax seeds, chia seeds
- **Spices:** Anise seeds, bay leaves (dried), cloves (ground and whole), crushed red pepper, fennel seeds, nutmeg, pure cinnamon (ground and sticks), ginger powder, ground cumin, turmeric powder, saffron, unrefined sea salt, whole black peppercorns

Shopping for groceries

If your disdain of grocery shopping is the only thing preventing you from enjoying wholesome food, by all means, consider a delivery service. Otherwise, choose the time that works best for you, preferably not the same time/day that you need to cook, to do your shopping. Here are some tips:

- Do your grocery shopping with a list for all your weekly menu needs in hand.
- Eat something before shopping so that you'll make better decisions.
- If shopping in a supermarket, stay around the perimeter of the store where fresh produce, meats, and dairy are featured.
- Stock up on seasonal produce — which is always offered at better prices — and be sure to incorporate several types into each day's meals. Be sure to have a wide variety of colors of the rainbow and as many types of greens — lettuces, broccoli, Swiss chard, spinach, kale, collards, arugula — as you can.

With a little practice, grocery shopping can be not only easy but also fun. Think about the luxury of having so many different types of products at your fingertips and how many people were involved in growing, cultivating, picking, preparing, and transporting them so that you can enjoy them in your meals. Try new things each trip, and enjoy the learning process.

Prepping Food

Once you've done your shopping, it's time to transform your kitchen into a place where a professional chef may feel at home. You'll want to set aside at least 2 hours per week to make this strategy work best. Invest in several airtight clear plastic or glass containers with fitting lids. Designate one shelf of your

refrigerator as the "prep station." Cut your veggies and greens into bite-size pieces and store them in the plastic containers on that shelf.

When you have time as soon as possible after you shop, prepare the base recipes for stock, beans, and tomato sauce (plus the others if you want) according to the recipes in the appendix. Then consider prepping some of your favorite grains or complex carbs (such as brown rice, quinoa, barley, and sweet potatoes) to have on hand. Next, prep your proteins (hard-boiled eggs, fish, lean meat, chicken, and/or soybeans) and allow them to cool. Once they're cool, store them in the containers as well.

Keep these ingredients in three separate areas in the refrigerator so that you'll remember to eat from the protein and carbohydrate categories each day. Be sure to combine with almonds, avocado, and/or extra-virgin olive oil for a well-balanced meal when you need it.

Finding and making the time to cook

Let go of the notion that you must have a certain amount of time to prepare meals each day. The truth is that that if you're organized, you can pull together great culinary solutions in just a few moments. If you have the right ingredients, you can't go wrong! Once you've got all your ingredients prepped, you can whip up quick, succulent, and nutritious meals in no time. On busy days, you can literally toss your ingredients together in the combinations that please you. We created the "Following Creative Meal Formulas for Quick Meals" section, later in this chapter, to give you inspiration.

If you prefer to make large meals and eat them throughout the week, it's best to make them and eat them over the course of a few days or freeze them in individual portions so you can eat them when you need to. Try using days that you don't need to work, early mornings, or late nights for meal prep. Keep already-prepared meals on hand for extra-busy times when you can't cook.

Having fun in the kitchen

Cooking can be a loathed chore or a coveted creative outlet. It's all in your perception but also in the amount of time you give yourself to enjoy the craft. Even professional chefs don't like to race through cooking large, complicated meals at home. Many chefs we know prefer a light salad with good-quality cheese and olive oil and vinegar as a quick meal over something elaborate when they've worked a strenuous day in the kitchen. Use the time-saving strategies in this book for when you need them and set aside special time for enjoying yourself in the kitchen when you can.

Here are a few ways to have more fun in the kitchen:

- Decide what aspect of cooking is most interesting to you (the joy of putting together ingredients creatively, saving money, or indulging in a sensory activity) and let that inspire you.
- Make dishes for yourself that you love but have a hard time finding in restaurants (family recipes, recreating food memories, and so on).
- Pick a theme — keep it fun with seasonal, multicultural, and interesting menus.
- Get your friends and family involved if they enjoy cooking. Fun is infectious, so if you have loved ones who enjoy cooking, invite them to join you in the process when possible.
- Experiment with creating new recipes! Inventing new flavor combinations in the kitchen can lead to a great sense of satisfaction.

Understanding the importance of community

Eating together is one of the common denominators among the countries that reap the health benefits of a traditional Mediterranean lifestyle. Communal eating is known to combat loneliness, the "newest epidemic" in America according to recent studies. Eating together has also been shown to help adolescents develop better eating habits.

When you cook and eat with others, it transforms necessary actions into daily pleasures. Psychologically, this shared activity signals your brain that you're safe, and it helps you overcome other emotional issues. In many cultures, cooking and eating are seen as communal activities. We would all fare better if we embrace that same spirit no matter where we live.

Following Creative Meal "Formulas" for Quick Meals

If you keep a fully stocked pantry, prepare the recipes from the appendix, and purchase fresh produce, there's no limit to the amount of meals you can prepare quickly. Keep the following 27 formulas on hand for when you're looking for a fast and nutritious meal and snack options. Always have carrots, celery, onions, garlic,

citrus fruits, eggs, cheeses, and fresh greens and/or vegetables on hand to stretch these meals even further.

Pantry menus

You may be surprised that you can prepare quick, healthy meals entirely (or almost entirely) from the shelf-stable items in your pantry. Table 10-1 gives some formulas for good pantry meals.

TABLE 10-1 Pantry Creations

Dish	Ingredients
Hummus	Chickpeas + Tahini + EVOO + Spices + Lemon juice
Middle Eastern Lentils with Rice	Lentils + Vegetable or Chicken Stock + Lentils
Falafel	Chickpeas + Spices + EVOO + Tahini
Risotto	Carnaroli rice + Stock + Saffron + Vegetable/Protein of your choice (optional)
Pasta with Beans	Beans + Rice + Tomato sauce + Stock
Pasta with Lentils	Pasta + Lentils + Garlic + Tomato sauce and/or Stock
Pasta with Tuna (or other fish)	Pasta + Tuna + EVOO + Olives and/or Tomato sauce
Rice Salad	Arborio rice + Olives + EVOO + Jarred vegetables + Beans
Pasta Salad	Short pasta + Olives + EVOO + Jarred vegetables + Beans
Chickpea Soup	Chickpeas + Stock + EVOO
Minestrone Soup	Beans and/or Lentils + EVOO + Pasta or rice or other grain + Tomato sauce + Stock + Dried porcini mushrooms + Vegetables
Bean Soup	Beans + Stock + Tomato sauce + EVOO
Pasta and Beans	Pasta + Beans + Stock + Tomato sauce + EVOO
Lentil Soup	Lentils + Stock + Tomato sauce + EVOO + Vegetables
Rice Pudding	Rice + Milk + Dried fruits and nuts + Honey or sugar
Tuna Salad	Tuna + EVOO + Beans of your choice
Chickpea or Bean Salads	Quinoa + Chickpeas or beans + EVOO + Vegetables + Spices
Pasta with Tomato Sauce and Vegetables	Pasta + Garlic + EVOO + Chili paste + Tomato sauce + Vegetables
Risotto Croquettes	Carnaroli rice + Stock + Saffron + Vegetable/Protein of your choice (optional)

Dish	Ingredients
Spaghetti with Garlic, Oil, and Chilis	Spaghetti + EVOO + Chili paste + Garlic
Bean or Lentil Dip	Beans or Lentils + Stock + EVOO + Spices
Roasted Chickpeas	Chickpeas + Spices + EVOO
Lentil, Bean, and Vegetable Skillet	Lentils + Beans + Fresh Vegetables or Olives + EVOO + Spices
Date, Almond, and Sesame Balls	Dates + Almonds + Sesame Seeds
Barley Soup	Barley + Stock + Beans or Legumes
Rice Pilaf	Rice + Spices + EVOO + Chickpeas + Nuts
Lentil Croquettes	Lentils + Spices + Bread crumbs + Tomato Paste + EVOO

Fridge foraging

Once a week, or prior to a grocery store trip, it can be fun to pull together a meal foraged from the fridge. Combining leftover tidbits in new ways can help you get creative in the kitchen. Use the formulas in the preceding section as your guide when repurposing leftovers.

Use leftovers to create unique soups, sandwiches, skillet meals, salads, stews, and omelets. Toss leftover vegetables and protein into any of the formulas in Table 10-1 to eliminate waste, save time, and save money.

Freezer bingeing

Like fridge foraging, freezer bingeing helps you put meals together and stretches out the time between shopping trips. If you stock vegetables and lean proteins in your freezer, you can combine them with whole grains, legumes, and seasonings from the pantry to pull flavorful meals together quickly. You can also keep individual portions of soups, stews, and sauces in the freezer to defrost and enjoy during times when cooking isn't possible.

The following foods hold up well in the freezer:

- Cooked soups and stews
- Sauces
- Raw meat cubes and chicken breast
- Fresh fruits and vegetables

Fast food the wholesome way

The completeness of a meal, nutritionally speaking, has nothing to do with how complex the recipe is. It also has nothing to do with whether other people consider the particular combination of foods to be a meal or whether you've seen those items eaten before. At the end of the day, it's important that a meal contains healthful fat, complex carbohydrates, and lean protein for it to be fit for someone with diabetes.

It's better to eat fresh foods that require no cooking — that is, "fast food the wholesome way" — than to eat unhealthy prepared food to fill up at the end (or beginning) of a busy day.

Here are some suggestions:

- Plain, whole-milk Greek yogurt with EVOO and seeds or spices or fresh fruit, honey, and almonds
- Whole wheat pita bread, crudités, and hummus
- Almonds, dried fruit, cheese, or a hard-boiled egg
- Fresh salad with a variety of vegetables, edamame beans, avocado, and walnuts dressed with good-quality EVOO and lemon

Keep these ideas on hand when you need to nourish yourself when you have little time or are on the run.

IN THIS CHAPTER

- Understanding the benefits of exercise
- Tailoring exercise for type 1 and type 2 patients
- Determining how long and how hard to exercise
- Choosing an activity you like

Chapter 11
Creating Your Exercise Plan

Exercise is one of your greatest tools to help you feel and look better while keeping your glucose levels balanced. Luckily, exercise can be fun and healthfully addictive, as well as having residual benefits on your mental and emotional health. Our bodies weren't designed to be sedentary, despite the way our lifestyles have changed over the years. Getting adequate physical activity will help you achieve your health goals, and if you choose a form of exercise you like, you'll even enjoy yourself in the process. The level of enjoyment that you experience will help you to heal and ward off other illness and complications as well.

WARNING

It's important to consult your primary care physician before beginning specific exercise plans.

In the Standards of Medical Care in Diabetes 2021, the American Diabetes Association states that structured exercise interventions of at least eight weeks' duration have been shown to lower A1C by an average of 0.66 percent in people with type 2 diabetes. Considerable data for better cardiovascular health and improved muscle

strength and insulin sensitivity were a result for those with type 1 diabetes. The standards also make the following recommendations:

- Most adults and those with type1 and type 2 diabetes should perform at least 150 minutes each week of moderate-intensity aerobic physical activity (50 to 70 percent of maximum heart rate), spread over at least three days per week, with no more than two consecutive days without exercise.
- In the absence of a medical reason not to, adults with diabetes should perform resistance training that involves all muscle groups at least twice per week on nonconsecutive days
- Flexibility training and balance training are recommended two to three times per week for older adults with diabetes. Yoga, Tai chi, and Pilates are good options.
- It is advisable to increase physical activity by doing everyday tasks such as energetic walking, housework, gardening, dancing, swimming, cooking, and even enjoying leisurely strolls in nature, as shown in Figure 11-1. Think of these tasks as being productive and also good for you rather than chores.
- Adults older than 65 should follow the physical guidelines if possible, and if not possible, they should be as physically active as able.

FIGURE 11-1: A leisurely walk in nature can be an enjoyable way to get exercise.

Maridav / Adobe Stock

REMEMBER

Prolonged sitting should be interrupted every 30 minutes for blood glucose benefits.

You don't have to set aside an hour daily to do your physical activity, although that amount would be best. There's no need to spend money on equipment or expensive gym memberships either. Since the last edition of this book, numerous studies have suggested that many other approaches to exercise can greatly improve control of type 2 diabetes and prevent prediabetes from turning into diabetes. Here are some of the best approaches:

- Doing just two 20-second intervals (high intensity) on an exercise bike three times a week has been shown to prevent type 2 diabetes and to lower the blood glucose if diabetes is present.
- Doing one minute of high-intensity exercise followed by one minute of rest, performed for 20 minutes (for a total of 10 minutes of intense exercise), three times a week, dropped average blood glucose levels from 137 mg/dl to 119 mg/dl.
- Using a pedometer to ensure a minimum amount of daily walking may reduce your chance of getting diabetes by half.

TIP

If you commit to walking an hour a day, the walking doesn't need to be done at one time, it could be done for 20 minutes before or after a meal or two 30-minute intervals. Even taking the stairs instead of the elevator or walking to do errands instead of driving provide results over time.

In this chapter, you discover why exercise is important, how much and what kinds you need to do to make a difference, and which specific exercises are best for you.

Getting Off the Couch: Why Exercise Is Essential

More than 80 years ago, the great leaders in diabetes care declared that diabetes management has three major aspects:

- Proper diet
- Appropriate medication
- Sufficient exercise

When the diabetes experts wrote their recommendations for proper care, the isolation and administration of insulin had just recently begun, and they were focusing specifically on how to control type 1 diabetes. Since that time, many studies have shown that exercise doesn't normalize the blood glucose or reduce the hemoglobin A1C (see Chapter 7) in type 1 diabetes. Many other studies have shown that exercise does normalize blood glucose and reduce hemoglobin A1C in type 2 diabetes. A study published in *Diabetes Care* in March 2012 showed that resistance exercise is associated with more prolonged reductions in blood glucose than aerobic exercise in type 1 diabetes.

Although exercise can't replace medication for the type 1 diabetic, its benefits are crucial for patients with both types of diabetes. Even modest physical activity may cancel out the adverse impact of diabetes on the heart and blood vessels.

TIP

Evidence has shown that it isn't just necessary to exercise but that spending too much time in sedentary activities is detrimental to your health. That is the reason for the recommendation to limit sedentary time. Get up every 30 minutes and move around. You can also try out a standing desk if you have an office job and alternate standing with sitting on a stability ball

Preventing macrovascular disease

The major benefit of exercise for both types of diabetes is to prevent *macrovascular disease* (heart attack, stroke, or diminished blood flow to the legs). Macrovascular disease affects everyone, whether they have diabetes or not, but it's particularly severe in people with diabetes. Exercise prevents macrovascular disease in numerous ways:

- Exercise helps with weight loss, which is especially important in type 2 diabetes.
- Exercise lowers bad cholesterol and triglycerides, and it raises good cholesterol.
- Exercise lowers blood pressure.
- Exercise lowers stress levels.
- Exercise improves mood and digestion.
- Exercise reduces the need for insulin or drugs.
- Exercise reduces inflammation, an underlying factor in many illnesses.
- Exercise reduces C-reactive protein, a marker of inflammation that is a factor in heart and blood vessel disease in diabetes (see Chapter 7).

Providing other benefits

In addition to its major benefits in the prevention of macrovascular disease, exercise provides a number of other very important benefits:

- Exercise has been shown to improve pancreatic beta-cell function, the very cells that produce insulin.
- Exercise is medicine for the brain. It stimulates the production of nerve cells, which prevent loss of memory, improve thinking, and enhance judgment.
- Higher levels of physical activity at midlife are associated with exceptional health among women at age 70 or older.
- Increased physical activity prevents weight gain as you age and weight regain if you diet.
- Exercise, even without weight loss, reduces the risk of diabetes.
- Higher levels of physical activity before pregnancy or in early pregnancy significantly lower the risk of gestational diabetes.

Taking charge of your health

John Plant is a 46-year-old male who has had type 1 diabetes for 23 years. He takes insulin shots four times daily and measures his blood glucose multiple times a day. He follows a careful diet.

Prior to developing diabetes, he was a very active person, participating in vigorous sports and doing major hiking and mountain climbing. At the time of his diagnosis, John's doctor warned him that he would have to give up many of the most strenuous activities because he would never know his blood glucose level, and it might drop precipitously during heavy exercise. He ignored this advice and continued his active way of life. He found that he could do with much less insulin than his doctor prescribed and rarely became hypoglycemic. He has been able to continue these activities without limitation. His blood glucose level is generally between 75 and 140. His last hemoglobin A1C was slightly elevated at 5.7 (see Chapter 7). A recent eye examination showed no diabetic retinopathy (see Chapter 5). He has no significant microalbuminuria in his urine and no tingling in his feet (see Chapter 5).

Is John lucky? You bet he is. But like most "luck," his is based on a self-realization that the human body is made up of both a mind and a body.

TIP

To take charge of your own health, you can find many health resources that at www.dummies.com. Try searching for **exercise and diabetes** or looking for the following articles:

- "10 Easy Exercises to Build a Strong Core without Leaving the House"
- "How Exercise Affects Sugar Metabolism"

Understanding your body mechanics during exercise

TIP

The feeling of fatigue that occurs with exercise is probably due to the loss of stored muscle glucose.

With exercise, insulin levels in nondiabetics and people with type 2 diabetes decline because insulin acts to store and not release glucose and fat. Levels of glucagon, epinephrine, cortisol, and growth hormone increase to provide more glucose. Studies show that glucagon is responsible for 60 percent of the glucose, and epinephrine and cortisol are responsible for the other 40 percent. If insulin did not fall, glucagon could not stimulate the liver to make glucose.

You may wonder how insulin can open the cell to the entry of glucose when insulin levels are falling. In fact, two things are at work here. Glucose is getting into muscle cells without the need for insulin, and the rapid circulation that comes with exercise is delivering the smaller amount of insulin more frequently to the muscle. The muscle seems to be more sensitive to the insulin as well, which is exactly what the person with type 2 diabetes hopes to accomplish when insulin resistance is the major block to insulin action.

TIP

One way to preserve glucose stores is to provide calories from an external source. Any marathoner knows that additional calories can delay the feeling of exhaustion. The timing is important. If the glucose is given an hour before exercise, it will be metabolized during the exercise and increase endurance. However, if it's given 30 minutes before exercise, it may decrease stamina by stimulating insulin, which blocks liver production of glucose.

Fructose can replenish you when you're doing prolonged exercise. This sweetener can replace glucose because it is sweeter but is absorbed more slowly and doesn't provoke the insulin secretion that glucose provokes. Fructose is rapidly converted into glucose inside the body. (See Chapter 8 for more on fructose.)

Reaping the benefits

As your body becomes trained with regular exercise, the benefits for your diabetes are very significant. Your body starts to turn to fat for energy earlier in the course of your exercise. At the same time, the hormones that tend to raise the blood glucose during exercise aren't produced at the same high rate because they aren't needed. Because you don't require as much insulin, your insulin doses can be reduced, and avoiding hypoglycemia during exercise becomes much easier.

Exercising When You Have Diabetes

WARNING

If you have diabetes and haven't exercised previously, you should check with a doctor prior to beginning a new exercise program, especially if you're over the age of 35 or if you've had diabetes for ten years or longer.

You should also check with a doctor if you have any of the following risk factors:

- The presence of any diabetic complications like retinopathy, nephropathy, or neuropathy (see Chapter 5)
- Obesity
- A physical limitation
- A history of coronary artery disease or elevated blood pressure
- Use of medications

You need to discuss these issues with your doctor to choose the appropriate exercises. We discuss the choice of exercise in the section "Is Golf a Sport? Choosing Your Activity," later in this chapter.

When you begin to exercise, whether you have type 1 or type 2 diabetes, you can take many steps to make your experience safe and healthful. Following are some important steps to take:

- Wear a bracelet identifying your first and last name, type of diabetes, food or drug allergies, and emergency contact numbers for your doctor and a family member or close friend.
- Test your blood glucose very often.
- Choose proper socks and shoes.
- Drink plenty of water.

- Carry treatment for hypoglycemia.
- Exercise with a friend.

And here are some things to avoid when you exercise:

- Don't assume that you have to buy lots of special clothing to exercise. The right shoes and socks are essential, but other than that, you need special clothing only if your sport demands it (such as soft pants for cycling).
- Don't expect to lose weight in certain spots by repetitively exercising them.
- Don't exercise to the point of pain.
- Don't get too focused on using exercise gadgets like belts or other objects that don't require you to move.

Working out with type 1 diabetes

People with type 1 diabetes or type 2 on insulin depend on insulin injections to manage blood glucose. They don't have the luxury of a "thermostat" that automatically shuts off during exercise and turns back on when exercise is finished. After an insulin shot is taken, it is active until it's used up.

WARNING

If you have type 1 diabetes, you have to avoid overdosing on insulin before exercise, which can lead to hypoglycemia, or underdosing, which can lead to hyperglycemia. If your body doesn't have enough insulin, it turns to fat for energy. Glucose rises because it isn't being metabolized but its production is continuing. If exercise is particularly vigorous in a situation of not enough insulin, the blood glucose can rise extremely high.

TIP

Reducing your insulin dosage prior to exercise helps prevent hypoglycemia. One study showed that an 80 percent reduction of the dose allowed the person with diabetes to exercise for three hours, whereas a 50 percent reduction forced the person with diabetes to stop after 90 minutes due to hypoglycemia. Each person with diabetes varies, and you must determine for yourself how much to reduce insulin by measuring the blood glucose before, during, and after exercise.

TIP

Another way to prevent hypoglycemia, of course, is to eat some carbohydrate (see Chapter 8). You need to have some carbohydrate (which quickly raises blood glucose) available during exercise.

In addition, the site of the insulin injection is important because it determines how fast the insulin becomes active. If you're running and inject insulin into your leg, it will be taken up more quickly than an injection into the arm would be.

You can exercise at whatever time you choose when you'll do it faithfully. If you like to sleep late and you schedule your exercise at 5:30 a.m., you probably won't consistently do it. Your best time to exercise is probably about 60 to 90 minutes after eating because the glucose is peaking at this time, providing the calories you need; if you exercise then, you avoid the usual post-eating high in your blood glucose, and you burn up those food calories. If you take insulin and prefer early-morning exercise, check your blood glucose and eat a snack if you're below 150 mg/dl. Don't exercise just before bedtime; it may cause hypoglycemia while you're sleeping.

Working out with type 2 diabetes

Other than the insulin discussion, many of the suggestions for type 1 patients in the previous section apply to type 2 patients as well.

With sufficient exercise and diet, some people with type 2 diabetes can revert to a nondiabetic state. This state doesn't mean that they no longer have diabetes, but it certainly means that they won't develop the long-term complications that can make them so miserable later in life (see Chapter 5).

WHAT ARE AEROBIC AND ANAEROBIC EXERCISE?

Aerobic exercise is exercise that can be sustained for more than a few minutes, uses major groups of muscles, and gets your heart to pump faster during the exercise, thus training the heart. We give you many examples of aerobic exercise throughout this chapter.

Anaerobic exercise, on the other hand, is brief (sometimes a few seconds) and intense and usually can't be sustained. Lifting large weights is an example of an anaerobic exercise. A 100-yard dash is another example.

Determining How Much Exercise to Do

Unless you have a specific physical restriction, you have no limitation on what kind of exercise or how much you can do. You should select one or more activities that you enjoy and will continue to perform. If you're new to exercise, it's a good idea to build exercise slowly by increasing the amount of exercise you get by an additional 10 percent per week in order to prevent injury and excess fatigue.

Exerting enough effort

TIP

In the past, exercise physiologists said that you needed to make sure that you monitored your exercise intensity by periodically checking your heart rate. Your exercise heart rate was supposed to be based on your age. The usual formula to figure this out is to take the number 220, subtract your age, and multiply that number by 60 to 75 percent to get the recommended exercise heart rate for aerobic exercise. (See the sidebar "What are aerobic and anaerobic exercise?" if you're not sure what aerobic exercise is.)

Now studies have shown that people can sustain aerobic exercise at higher heart rates. Perhaps the best way to know whether you're meeting your exercise goals is to use the perceived exertion scale described in the sidebar "Checking the value of your exercise."

The younger you are, the faster your exercise heart rate may be. Like everything in this book, your exercise heart rate is an individual number. If you're a world-class athlete training for your ninth marathon, your exercise heart rate may be higher. If you have some heart disease, your exercise heart rate may be significantly lower.

CHECKING THE VALUE OF YOUR EXERCISE

Measuring your pulse during exercise (or even at rest) may be hard for you. Instead, you can use the perceived exertion scale. Exercise is given a descriptive value from *extremely light* to *extremely hard* with *very light*, *light*, *somewhat hard*, and *very hard* in between. You want to exercise to a level of somewhat hard, and you'll be at your target heart rate in most cases. As you get into shape, the amount of exertion that corresponds to somewhat hard will increase.

Here is a description of these various levels of exercise:

- Extremely light exercise is very easy to do and requires little or no exertion.
- Very light exercise is like walking slowly for several minutes.

- Light exercise is like walking faster but at a pace you can continue without effort.
- Somewhat hard exercise is getting a little difficult but still feels okay to continue.
- Very hard exercise is difficult to continue. You have to push yourself, and you're very tired. At this level, you have trouble talking. The very hard level of exercise is most beneficial, but it isn't for everyone. Be sure to check with your doctor before engaging in very hard exercise to make sure that it is safe for you.
- Extremely hard exercise is the most difficult exercise you've ever done.

Tip: You should be able to talk or sing comfortably while doing aerobic exercise.

Warning: Don't continue exercising if you have tightness in your chest, chest pain, severe shortness of breath, or dizziness.

Devoting an hour a day

When you know your maximal exercise heart rate, you can choose your activity and use the perceived exertion scale to be sure that you achieve that level during exercise. We must repeat that the best choice of exercise for you is an exercise you enjoy and will continue to perform.

The choices are really limitless. The number of kilocalories you use for any exercise is determined by your weight, the strenuousness of the activity, and the time you spend actually doing it. In the past, it was suggested that to have a positive effect on your heart, you need to do a moderate level of exercise for 20 to 45 minutes at least three times a week. In 2002, the Institute of Medicine (the medical division of the National Academies) recommended that to maintain health and a normal body weight, you need to do one hour of exercise a day.

REMEMBER

An hour (not an apple) a day keeps the doctor away! Moderate aerobic exercise done for an hour every day provides enormous physical, mental, and emotional benefits. Exercise cancels out the changes induced by overfeeding and reduced activity.

You need to warm up and cool down for about five minutes before and after you exercise. Stretching is one possibility for both warm-up and cool-down. We're not going to discuss stretching in detail because the importance of stretching for the healthy exerciser isn't clear. One study showed that a group of runners who didn't stretch did better than a group who did. Most doctors agree that stretching after an injury is appropriate, but whether all the advice about stretching before exercise for an uninjured person is much ado about nothing is yet to be determined. If

you do stretch, don't stretch to the point that it hurts, or you risk tearing muscle. See the excellent book *Diabetes and Keeping Fit For Dummies*, by Sheri R. Colberg (John Wiley & Sons, Inc.), for more about stretching.

Making moderate exercise your goal

Moderate exercise has a moving definition. If you're out of shape, moderate exercise for you may be slow walking. If you're in good shape, moderate exercise may be jogging or cross-country skiing. Moderate exercise is simply something you can do without getting out of breath. For ideas on the types of exercise you can do, see the following section.

How long can you stop exercise before you start to decondition? It takes only about two to three weeks to lose some of the fitness your exercise has provided. Then it takes up to six weeks to get back to your current level, assuming that your holiday from exercise doesn't go on too long.

Is Golf a Sport? Choosing Your Activity

The following factors can help you determine your choice of activity:

- Do you like to exercise alone or with company? Pick a competitive or team sport or a group fitness class if you prefer company.
- Do you like to compete against others or just yourself? Running or walking are activities you can do alone.
- Do you prefer vigorous or less-vigorous activity? Less-vigorous activity over a longer period is just as effective as more-vigorous activity.
- Do you live where you can do activities outside year-round, or do you need to go inside a lot of the year? Find a sports club if weather prevents year-round outside activity.
- Do you need special equipment or just a pair of running shoes?
- What benefits are you looking for in your exercise — cardiovascular, strength, endurance, flexibility, or body fat control? You should probably look for all these benefits, but you may have to combine activities to get them all in.
- Do you have any balance problems? If so, swimming and water aerobics are great choices for you.

TIP

Perhaps a good starting point in your activity selection is to focus on the benefits. Table 11-1 gives you some ideas.

TABLE 11-1 Match Your Activity to the Results You Want

If You Want to . . .	Then Consider . . .
Build up cardiovascular condition	Vigorous basketball, pickle ball, squash, cross-country skiing, handball, swimming, aerobics, dancing
Strengthen your body	Low-weight, high-repetition weight lifting; gymnastics; swimming; mountain climbing; cross-country skiing; biking; Pilates; and Tai chi
Build up muscular endurance	Gymnastics, rowing, cross-country skiing, vigorous basketball, Pilates, resistance training
Increase flexibility	Gymnastics, yoga, judo, karate, soccer, surfing
Control body fat	Handball, pickle ball, squash, cross-country skiing, vigorous basketball, singles tennis

You can tell from this table that living in places with plenty of snow is helpful because cross-country skiing is on almost every list. On the other hand, so is vigorous basketball, so you don't have to give up exercise if you live in a warm climate like Florida.

TIP

The special needs of many of these sports may turn you off to exercise. The curious thing is that the best exercise that you can sustain for life is right at your feet. A brisk daily walk improves heart function, adds to muscular endurance, and helps control body fat. So many people drive their cars to the gym and try to park as close as possible so that they can get to the building with as little effort as possible. Seems a little strange, doesn't it?

Of course, the social benefits of exercise are very important. You're together with people who are concerned with health and appearance. These people usually share many of your interests. People who like to jog often like to hike and climb and camp, too. Many lifetime partnerships begin on one side of a tennis court and on the dance floor.

Cross-training, where you do several different activities throughout the week, is a good idea. Cross-training reduces the boredom that may accompany doing one thing day after day. It also permits you to exercise regardless of the weather because you can do some things indoors and some outside.

Table 11-2 lists a variety of activities, including some that don't exactly fit into the category of *exercise* but offer some interesting comparisons. Next to each activity, we include the amount of kilocalories that a 125-pound person and a 175-pound person burn in 20 minutes.

TABLE 11-2 Calories Burned in 20 Minutes at Different Body Weights

Activity	Kilocalories Burned (125 pounds)	Kilocalories Burned (175 pounds)
Standing	24	32
Walking, 4 mph	104	144
Running, 7 mph	236	328
Gardening	60	84
Writing	30	42
Typing	38	54
Carpentry	64	88
House painting	58	80
Playing baseball	78	108
Dancing	70	96
Playing football	138	192
Golfing	66	96
Swimming	80	112
Skiing, downhill	160	224
Skiing, cross-country	196	276
Playing tennis	112	160

Everything you do burns calories. Even sleeping and watching television use 20 kilocalories in 20 minutes if you weigh 125 pounds.

TIP

A study published in the *European Journal of Preventive Cardiology* in December 2014 looked at 2,768 people to measure the benefits of yoga compared to exercise or no physical activity. The authors found that yoga is as beneficial as aerobic exercise and much more beneficial than no exercise in the prevention of heart and blood vessel disease. Yoga was found to reduce blood pressure, cholesterol, and weight while improving mood, back, pain, mobility, and circulation. Yoga therapy is a modality that helps patients achieve health goals through breathing and movement exercises.

WARNING

Your choice of an activity must take into account your physical condition.

Nowadays, there are hundreds of fitness videos available for free online that you can even do while confined to a chair. If you have diabetic neuropathy (see Chapter 5) and can't feel your feet, you don't want to do pounding exercises that may damage them without your awareness. You can swim, bike, row, or do arm-chair exercises where you move your upper body vigorously. One machine that gives you a good workout without trauma to your joints is the elliptical trainer, but you may have to join a club to use one unless you buy one for home.

REMEMBER

A study published in the *Journal of the American College of Cardiology* in February 2015, which followed joggers for a total of 12 years, showed that 1 to 2.4 hours of light jogging per week is the healthiest form of running. Over the 12-year period, strenuous joggers were as likely to die as sedentary non-joggers.

If you have diabetic retinopathy (see Chapter 5), you won't want to do exercises that raise your blood pressure (like weight lifting), cause jerky motions in your eyes (like bouncing on a trampoline), or change the pressure in your eyes significantly (like scuba diving or high mountain climbing). You also shouldn't do exercises that place your eyes below the level of your heart, such as when you touch your toes.

Patients with nephropathy (see Chapter 5) should avoid exercises that raise the blood pressure for prolonged periods. These exercises are extremely intense activities that you do for a long time, like marathon running.

Some people have pain in the legs after they walk a certain distance. It may be due to diminished blood supply to the legs so that the needs of the muscles in the legs can't be met. Although you need to discuss this problem with your doctor, you don't need to give up walking. Instead, determine the distance you can walk up to the point of pain. Then walk about three-quarters of that distance and stop to give the circulation a chance to catch up. After you rest, you can go about the same distance again without pain. By stringing several of these walks together, you can get a good, pain-free workout. You may even find that you're able to increase the distance after a while because this kind of training tends to create new blood vessels.

Is there a medical condition that should absolutely prevent you from doing exercise? Short of chest pain at rest, which must be addressed by your doctor, the answer is no. If you can't figure out an exercise that you're able to do, get together with an exercise therapist. You'll be amazed at how many muscles you can move that you never knew you had.

Walking 10K Steps a Day

The idea of walking 10,000 steps a day may seem like a huge, unattainable goal to you, but you may be surprised. This goal is certainly worth striving toward because, as we discuss previously in this chapter, walking is one of the most beneficial exercises you can do. All of your steps count, and 10,000 steps can be all the daily exercise you need to do in addition to resistance training (weight lifting, for example).

Having a target of 10,000 steps a day can be a great motivator. On the other hand, don't give up if you don't achieve this number every day. Although the figure is based on good evidence that shows the benefits to health of walking regularly, there is research to show that some groups of people, for example older populations, may gain little beyond a figure of 7,500 steps each day. Getting regular "steps" contributes to good health, but it is even more important to enjoy and celebrate activity and exercise rather than feeling bound to a target number.

The first step toward reaching this goal is to buy a *pedometer,* a device that you wear on your belt or wrist that counts each step you take. Don't buy a fancy one with a lot of bells and whistles. All you need is to be able to count your steps and, if you want, to convert the steps into miles. To do this, you need to know how far you walk each time you take a step. Walk ten steps, measure the distance, and divide by ten to get your stride length. Input this number in the appropriate place in the pedometer, and it will give you the miles that correspond with the steps you walk.

Cell phone apps and smartwatches make it easier than ever to track steps. Find the program, watch, or app that works best for you to keep track of your progress. Begin by doing your usual amount of exercise each day. Remember to record the steps at the end of the day and reset the button on the pedometer to zero. After seven days, add up the steps and divide by seven to get your daily count. You'll probably find that you're doing between 3,000 and 5,000 steps a day. This level of steps is considered a sedentary level.

Next, you want to build up your daily number. Use the catchy phrase *10k a day* to remind you to do extra walking to reach 10,000 steps. Here are some tips to help:

- Get a good pair of walking shoes or sneakers and replace them when they begin to wear out.
- Consult your podiatrist and see whether you can have a pair of orthotic inserts made for your sneakers. This will provide great relief to your feet while walking, and some insurance companies pay for them.

- If you drive everywhere, try leaving your car parked. If you can make a trip in an hour or less by foot, save your gas money and add substantially to your daily step count.
- Try to add a few hundred steps a week. Begin by identifying a baseline day in your first week when you did the most steps, and make every day like that one. Each week, add a few hundred more.
- Find an exercise buddy to walk with you to help keep you on track and get some socialization in at the same time.
- If the weather is bad, or it's too early/late to walk when your schedule permits, consider a walking exercise video on YouTube. They're available in one-, two-, and three-mile intervals, and some, such as those created by Leslie Sansone, are actually designed for those with diabetes and endorsed by The American Diabetes Association.
- Keep a record of the number of steps involved in various walks you take so you can easily get the steps you're missing on any given day.
- Use stairs instead of the elevator, whether you're going up or down.
- Take a walk at lunchtime daily.
- Stop if you feel pain, and check with your doctor before continuing.

If you don't have a pedometer, or if you want to count other types of exercise toward your walking goal, use the following conversions:

- 1 mile = 2,100 average steps
- 1 block = 100 average steps
- 10 minutes walking = 1,200 steps on average
- Biking or swimming = 150 steps per minute
- Weight lifting = 100 steps per minute
- Roller skating = 200 steps per minute

TIP

If you like tangible rewards for what you do (besides the reward of a lower blood glucose, a lower cholesterol, a lower blood pressure, and possibly a lower weight), join an online group. Many exercise and step-tracking apps offer social engagement to help you meet your goals and stay inspired.

A study in the *Archives of Internal Medicine* in June 2003 provides the best evidence for the benefits of walking. Diabetics who walked at least two hours a week had a 40 percent lower death rate than inactive diabetics.

Another study in *Diabetes Care* in June 2005 entitled "Make Your Diabetic Patients Walk" followed for two years 179 patients with type 2 diabetes who were divided into six groups. The groups differed in the amount of increased exercise they did. For example, the first group did a little more exercise by the end of the study, whereas the last group did much more exercise by the end of the study. The other groups fell in between those extremes.

The results were that the highest exercisers had the lowest blood pressure, greatest weight loss, greatest reduction in total cholesterol and bad cholesterol, greatest increase in good cholesterol, greatest reduction in blood glucose, and greatest reduction in money spent on medications. Although the people who did the least exercise had no change in the cost of their annual medications, the highest exercisers had a reduction of $660 per year. What are you waiting for? Take the first steps!

Lifting Weights

Weight lifting is a form of anaerobic exercise. (See the sidebar earlier in this chapter if you're not sure what anaerobic exercise is.) It involves the movement of heavy weights, which can be moved only for brief periods of time. It results in significant muscle strengthening and increased endurance.

Doctors are looking for drugs that can increase insulin sensitivity (see Chapter 12). You need look no further. Lifting weights has been shown in several studies to accomplish this. Writing in *Diabetes Care* in September 2007, a group of investigators from the Centers for Disease Control showed that muscle-strengthening activity significantly increased insulin sensitivity, thereby lowering the blood glucose and the hemoglobin A1C in 4,500 adults between the ages of 20 and 70.

Older adults from age 50 and above who were given only eight weeks of flexibility and resistance training had substantial improvement in strength and flexibility while their glucose levels improved as well.

WARNING

Because weight lifting causes a significant rise in blood pressure, people with severe diabetic eye disease shouldn't do it unless your blood pressure is under very good control. Check with your doctor.

Weight training, which uses lighter weights, can be a form of aerobic exercise. Because the weights are light, they can be moved for prolonged periods of time. The result is improved cardiovascular fitness along with strengthening of muscles, tendons, ligaments, and bones. Weight training is an excellent way to protect and strengthen a joint that's beginning to develop some discomfort.

TIP

We recommend that you do seven different exercises with light weights every other day, or daily if possible. Choose weights that permit you to do each exercise ten times in a row, for three sets of ten with a rest in between each set. You should need only five to ten minutes to complete all seven, and the benefits will be huge. These exercises are the bicep curl, shoulder press, lateral raise, bent-over row, good mornings, flys, and pullovers. You may want to do them initially with a trainer to make sure you do them correctly. There are many free exercise videos online with low-impact strength training tutorials.

Figure 11-2 shows the bicep curl. To do this exercise:

1. **Hold the dumbbells along the sides of your body, palms facing forward.**
2. **Raise the dumbbells until your elbows are fully bent.**
3. **Slowly lower the dumbbells to the original position.**

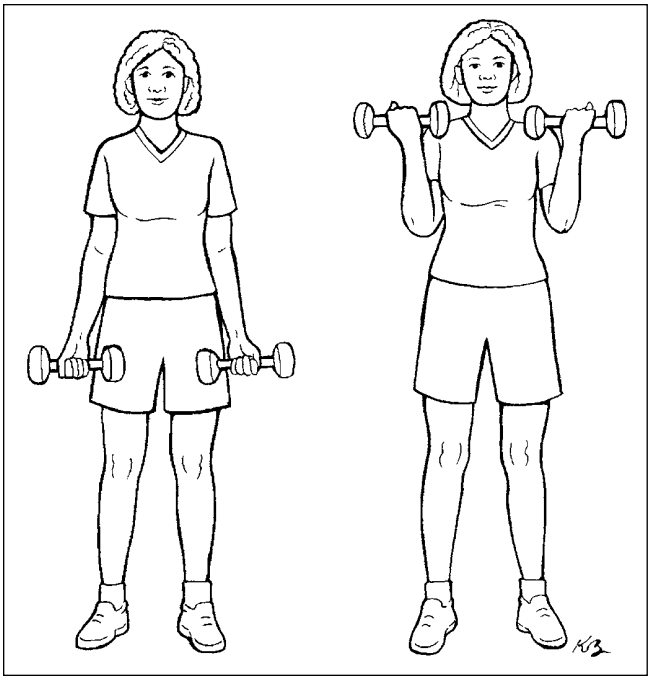

FIGURE 11-2: Bicep curl.

Illustration by Kathryn Born

Figure 11-3 shows the shoulder press. To do this exercise:

1. **Hold the dumbbells with your palms facing each other and your elbows bent.**

2. **Raise the dumbbells over your head, turning your palms to face forward.**
3. **Lower the dumbbells to the original position.**

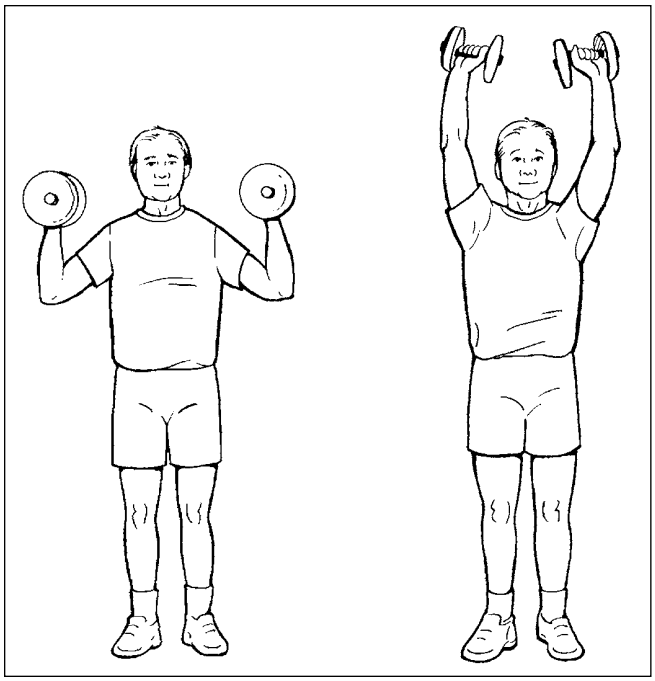

FIGURE 11-3: Shoulder press.

Illustration by Kathryn Born

Figure 11-4 shows the lateral raise. To do this exercise:

1. **Hold the dumbbells along the sides of your body, palms facing each other.**
2. **Lift the dumbbells out to the sides, palms facing the floor, until they are above your head.**
3. **Lower the dumbbells down to your sides.**

Figure 11-5 shows the bent-over row. To do this exercise:

1. **Hold a dumbbell in each hand, arms hanging down, legs straight, and back bent as necessary toward the floor.**
2. **Raise the dumbbells up to your chest with your back parallel to the floor.**
3. **Lower the dumbbells toward the floor.**

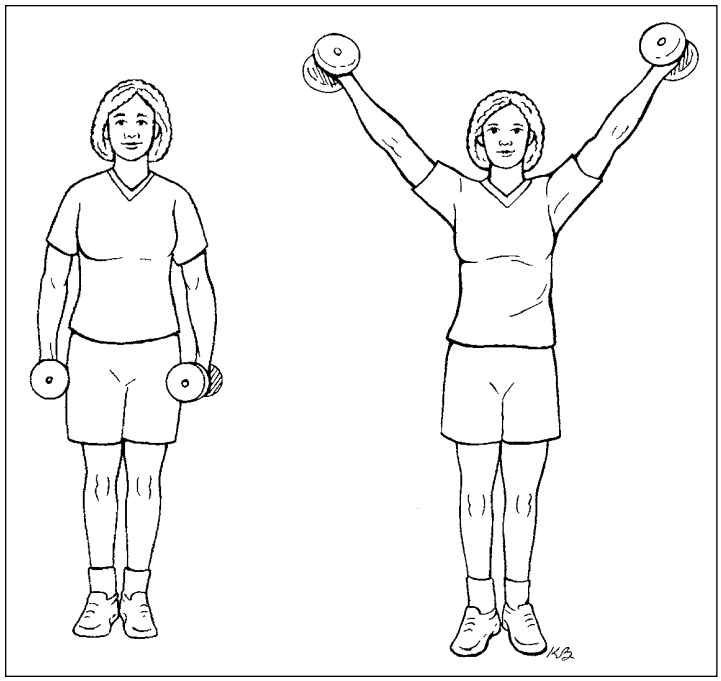

FIGURE 11-4:
Lateral raise.

Illustration by Kathryn Born

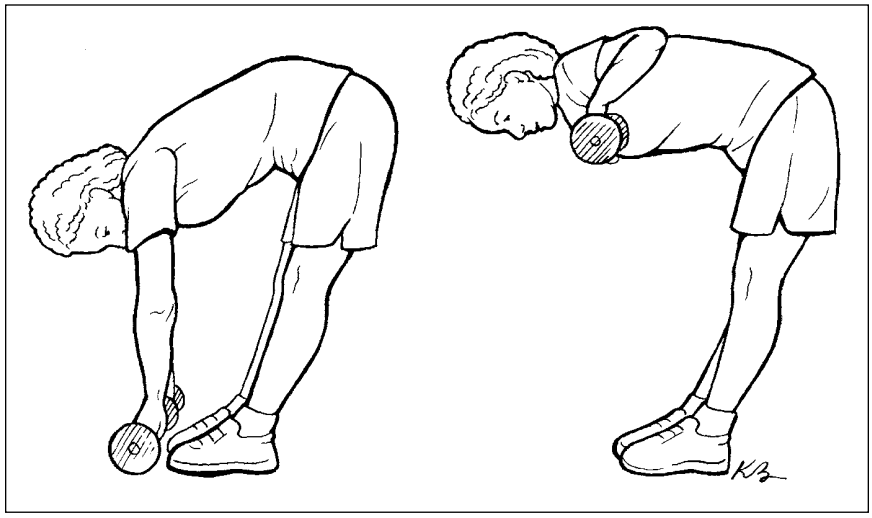

FIGURE 11-5:
Bent-over row.

Illustration by Kathryn Born

Figure 11-6 shows good mornings. To do this exercise:

1. **Hold the ends of one dumbbell above your head, arms straight.**
2. **Lower the dumbbell forward as you bend so that your back is parallel to the floor.**
3. **Raise the dumbbell to the original position.**

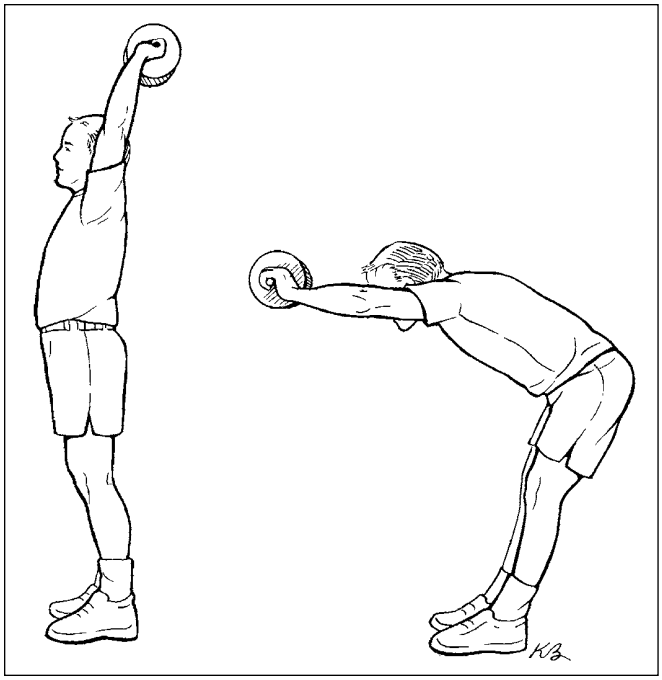

FIGURE 11-6: Good mornings.

Illustration by Kathryn Born

Figure 11-7 shows flys. To do this exercise:

1. **Lie on your back and hold the dumbbells out to each side at the shoulder.**
2. **Lift the dumbbells together until they are above your head.**
3. **Lower them to the sides again.**

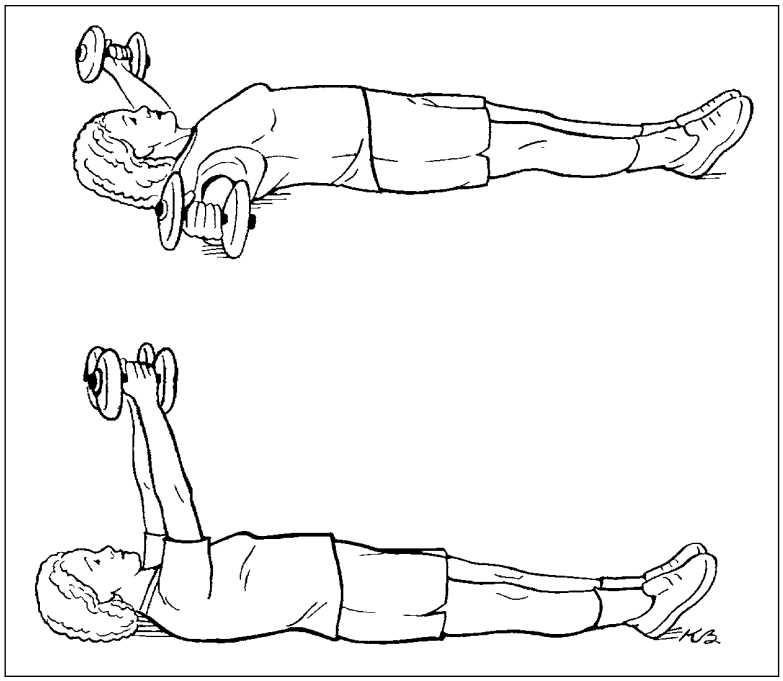

FIGURE 11-7: Flys.

Illustration by Kathryn Born

Figure 11-8 shows pullovers. To do this exercise:

1. **Lie on your back holding one dumbbell with both hands straight up above your head.**
2. **Lower the dumbbell with your arms straight to the floor behind your head.**
3. **Raise the dumbbell back above your head.**

Older people in nursing homes who are given weights of just a few pounds have shown excellent return of strength to what appeared to be atrophied muscles. The benefits for you will be that much greater.

Weight training may be good for the days that you don't do your aerobic exercise, or you can add it for a few minutes after you finish your activity. Weight training is also good for working on a particular group of muscles that you feel is weak. Very often, these muscles are in the back. Weight-training exercises can isolate and strengthen each muscle.

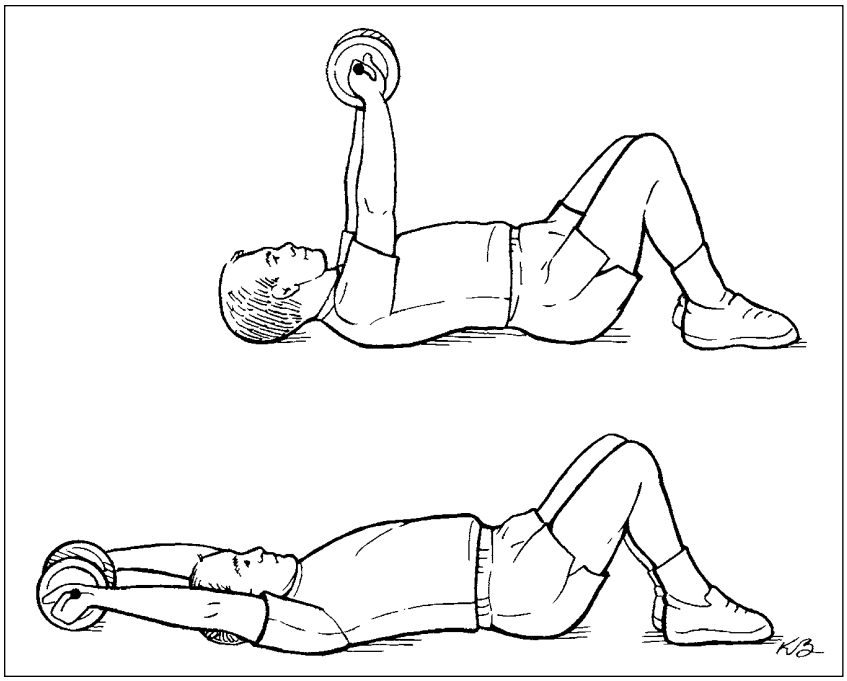

FIGURE 11-8: Pullovers.

Illustration by Kathryn Born

Alongside a healthy diet, regular exercise has an extraordinarily beneficial effect on health. It's free, enjoyable, and improves both physical and mental health. Exercise improves glucose control, increases insulin sensitivity, decreases markers of inflammation and independently reduces the risk of vascular complications of diabetes. Reaping the rewards of whichever form of exercise you enjoy most is a crucial part of your approach to optimizing your diabetes self-care.

IN THIS CHAPTER

- Taking pills to control blood glucose in type 2 diabetes
- Using insulin injections in type 1 diabetes
- Combining oral agents and insulin type 2 diabetes
- Adding herbs and supplements to support blood sugar regulation
- Looking at surgical options when necessary

Chapter 12

Finding Your Best Treatment: Medication and More

Your doctor will discuss with you the goals you can aim for to reduce your HbA1C. Recommendations vary with age (read more in Chapters 14 and 15), and you and your doctor may decide together to have more ambitious targets as the control of your diabetes improves. It may be that you can reduce and maintain your HbA1C to lower than the levels that define diabetes through lifestyle changes of improved diet, weight loss, and exercise, effectively reversing diabetes. Some doctors prefer to call this *remission* from diabetes to acknowledge the risk that despite your best efforts, your HbA1C may rise again.

Characterizing the best lifestyle strategies to reduce HbA1C and even cross the threshold that defines diabetes is an exciting area of ongoing research. It needs to be viewed in the context not only of the absolute HbA1C number but also the degree to which changes in diet sustainably protect from illnesses, especially, but not limited to, those which are complications of diabetes.

If lifestyle measures alone aren't enough to gain acceptable control of your diabetes (as reflected in reductions in HbA1C) at this stage, you and your doctor may decide that it's best for you to start a medication. This isn't necessarily for life; your lifelong commitment needs to be to gain optimum control of your health, and it may be possible to make improvements to your lifestyle and, in discussion with your doctor, try reducing the number of drugs, doses, or even stopping medications if your HbA1C is improving. Evidence supports the use of medications where appropriate to reduce the complications of diabetes either directly by reducing excessively high circulating glucose or through treating other related conditions such as high blood pressure, lipid levels, or kidney disease. It's important that you're aware of all the possible lifestyle changes you can make either through talking with the team looking after your care or from a structured, quality assured and recognized education program.

In this chapter, we describe the medications that are most frequently used when it is appropriate for them to be introduced. Depending upon the type of diabetes that you are diagnosed with and your blood sugar levels, taking pills to control blood glucose and using insulin injections may be necessary. In this chapter, we discuss oral agents and insulin in type 1 and 2 diabetes, adding herbs and supplements to support blood sugar regulation, and avoiding drug interactions. We also give an overview of surgical options as a last resort.

Deciding When Medications Are Necessary

You and your doctor will decide on treatments, taking into account your personal preferences, the likely benefits, the risk of side effects, and any practical issues you may face as well as considering any other conditions you may have and their treatment. Your target HbA1C and how important it is to achieve will depend on your circumstances, including your age (we discuss this in Chapter 15).

You and your doctor will regularly review the success of your management plan and may choose to alter it if it isn't effective or you have unacceptable side effects. Decisions are individual and personal to you but should follow expert guidelines that are regularly updated by reputable organizations, independent of the pharmaceutical industry, and with no conflict of interest. These organizations include the American Diabetes Association (ADA) in the United States, the National Institute for Health and Care Excellence (NICE) in the United Kingdom, the European Association for the Study of Diabetes (EASD), and other recognized regional scientific committees.

Sharing Decisions and Considering Risks and Side Effects

The descriptions of the medicines in this chapter should be used only as a guide. We don't list all the contraindications or side effects, though we do highlight very common ones. It's important to discuss these medications with your diabetes team, including your doctor and pharmacist, as well as read the information leaflets with the medicine. The final choice of medication or combination of medications will depend on many factors, weighing up the benefits of achieving optimum control of your diabetes with any risks that may come with taking these medicines, as well as being aware of any constraints you may have with tolerating particular ones.

Taking Pharmaceuticals

For years, insulin by injection was the only treatment available for diabetes. Fortunately, oral medications have been available for some time for type 2 diabetes, and more are being researched and developed. The history of medicine has many examples of therapies such as insulin that have been used successfully for a long time and continue to a treatment of choice for some patients. Also, some medications have been superseded by more effective or better tolerated alternatives. Finally, some are licensed following clinical trials but subsequently withdrawn when potentially serious adverse effects come to light.

TIP

Medication names can be confusing. We recommend that you get familiar with the *generic* or chemical name of your medication. This will always be identified on the bottle or box by the manufacturer, though many countries permit it to be in a smaller print size. When a medication's patent runs out, other companies may be licensed to produce it. Although knowing the chemical name may seem more complicated than remembering a more recognizable brand name, it's important, especially in countries where dispensing pharmacists are permitted to choose different pharmaceutical producers' versions of the same generic medication. This is allowed only where producers all meet the same standards, where the doctor agrees, and where the effects of the medication aren't specifically affected by its brand. Countries have different available brands, and often the names aren't the same, so when traveling, knowing the generic name of your medication is useful, in case you need more and can only get the nearest equivalent drug. Doctors around the world will recognize the generic name.

REMEMBER

Medications are usually measured in micrograms, milligrams, and grams — that is, 500mcg is the same as 0.5mg. Two 500mg tablets taken together make a total of 1g of the medication. Often medications are made in different strengths of tablets, so make sure you know how many tablets you're taking and of which strength. If you and your doctor have agreed to increase your dose, you may be converted to a single tablet of higher strength or you may take more than one tablet of a lower strength. Sometimes a medication may be available in a modified or slow-release form, which allows a dose over 24 hours to be achieved in a tablet or capsule taken less frequently. Note that different medications are effective at different concentration. It's not possible to say that drug A is stronger than drug B because the usual dose in milligrams is higher. Drug A and drug B, being unique, have different concentrations at which they work.

TIP

Diabetes can be expensive, especially if you need several drugs to control your blood glucose. The pharmaceutical companies understand, and several offer programs to provide medication for a period of time. Chapter 16 explains what you need to know about these companies as well as an international perspective on healthcare.

Sulfonylureas

Scientists discovered sulfonylureas accidentally when they noticed that soldiers who were given certain sulfur-containing antibiotics developed symptoms of low blood glucose. When scientists began to search for the most potent examples of this effect, they came up with several different versions of this drug. Sulfonylureas all have the following characteristics:

- They work by making the pancreas release more insulin.
- They're not effective in type 1 diabetes where the pancreas isn't capable of releasing any insulin.
- Sometimes they don't work when first given (primary failure), but they almost always stop working within a few years after you start them (secondary failure). Sulfonylureas continue to be used because, for most people, they improve glucose control for at least those first few years.
- They're all capable of causing hypoglycemia.
- When you use any of a class of antibiotics called sulfonamides, the glucose-lowering action of the sulfonylureas is prolonged.
- They can be fairly potent when given in combination with one of the other classes of oral agents.

The sulfonylurea class of medications includes examples such as gliclazide, glipizide, glimepiride, tolbutamide, and glyburide (known as glibenclamide in some countries outside the United States). These are their chemical names, and they come in numerous branded forms with trade names that may also be familiar to people taking them. Some of the earlier versions of this group of drugs are no longer produced because they've been replaced by more modern versions — so-called *second-generation* sulfonylureas — with fewer side effects.

These were the first-choice drugs for many years in the United States, whereas metformin (see the next section) was preferred as the initial medication in Europe. Sulfonylurea medications have been relegated to third-choice medications in some guidelines recently, and their use is reserved for people whose diabetes is more challenging to control. The reasons for this are because of concerns about possible associations with an increased risk of heart disease with long-term use but even more due to the risk of potentially fatal hypoglycemia, especially in older people. This can be particularly difficult to manage with long-acting sulfonylureas, such as glyburide, where the hypoglycemic effects can be prolonged. Other possible side effects include gastrointestinal disturbances, weight gain, and rashes as well as rarer adverse reactions that have been reported.

Metformin

Metformin — brand names Glucophage, Fortamet, and Glumetza — is an entirely different kind of glucose-lowering medication. Outside the United States, it's called Benoformin, Dextin, Diabex, Diaformin, Fornidd, Glucoform, Gluformin, Metforal, Metomin, and Orabet. Some long-acting versions are available and can be taken less frequently. Usually this is denoted by XL (extra-long acting), MR (modified release), or SR (slow/sustained release) in the brand title.

More than 30 years ago, the United States banned a sister medication called *phenformin* because of an association with a fatal complication. Metformin has been used in Europe for years without much trouble and was finally approved in the U.S. in 1995. Metformin is rarely, and perhaps never, associated with the fatal complication *lactic acidosis* that caused phenformin to be banned.

Metformin has the following characteristics:

- It lowers the blood glucose mainly by reducing the production of glucose from the liver (the *hepatic* glucose output).
- It works for both type 1 and type 2 diabetes because (unlike the sulfonylureas) it doesn't depend on stimulating insulin to work.
- It may increase the sensitivity of the muscle cells to insulin and slow the uptake of glucose from the intestine.

- It's available in 500 mg, 850 mg, and 1,000 mg tablets. It's also available as a liquid containing 500 mg per 5 milliliters called Riomet and as an extended release form containing 750 mg.
- The maximum dose is 2,500 mg taken in divided doses with each meal.
- A relatively inexpensive generic form is available, which is just as good as any of the brand-name forms.
- Used by itself (a treatment called *monotherapy*), it doesn't cause hypoglycemia. However, when given in combination with the sulfonylureas, hypoglycemia can occur. If low blood glucose is persistent, the dose of sulfonylurea is reduced.
- It must be taken with food because it causes gastrointestinal irritation, but this side effect often declines with time. It's the most common reason for metformin not being tolerated. Long-acting versions of metformin may overcome this problem.
- It's often associated with weight loss, possibly from the gastrointestinal irritation or because of a loss of taste for food.
- It's not recommended if you have significant liver disease, kidney disease, or heart failure.
- It's usually stopped for a day or two before surgery or an X-ray study that uses a dye. Doses restart two days later.
- It's not recommended for use by people with an alcohol problem.
- Metformin reduces the occurrence of heart and blood-vessel disease as well as cancer in diabetes and should probably be continued if insulin is added in type 2 diabetes. It significantly reduces major heart and blood vessel damage compared to sulfonylureas.
- After gastric bypass, uptake of metformin in the intestine is increased, so a reduction in dosage may be necessary.

TIP

It's been observed that metformin use may be associated with low levels of vitamin B12. Vitamin B12 is very important for normal mental functioning, so it's important to get the level of this vitamin checked if you're taking long-term metformin. Supplementation may be required.

TIP

Metformin was previously stopped when kidney disease occurred. The drug is considered to be so useful that experts now recommend continuing to use it and perhaps lowering the dose except in very severe kidney disease, when it must be stopped. Recent evidence (*JAMA Internal Medicine*, December 2014) supports the use of metformin in patients with mild to moderate kidney disease. Discuss continuing it with your doctor if you have kidney disease and diabetes. In the event of

a sudden infection or other cause of an "acute kidney injury," metformin may need to be temporarily stopped or the dose reduced depending on the extent of the reduced kidney function either anticipated or measured by blood tests.

Metformin can be a very useful drug, especially when *fasting hyperglycemia* (high blood glucose upon awaking) is present. Metformin has some positive effects on the blood fats, causing a decrease in triglycerides and LDL cholesterol and an increase in HDL cholesterol. About 10 percent of patients fail to respond to it when it's first used, and the secondary failure rate is 5 to 10 percent a year. It occasionally causes a decrease in the absorption of vitamin B12, a vitamin that's important for the blood and the nervous system.

Metformin is a common monotherapy because of the low risk of hypoglycemia and its cardioprotective effects. If control isn't optimum, doctors may choose a second medication from another class of drugs. Some combinations are produced in a single tablet, and many doctors prefer this for convenience. This can also aid compliance and be easier to administer by a visiting caregiver if a person with diabetes is unable to take their medications. However, it does mean that it isn't possible to adjust the doses of the individual components as required when reviewing a treatment management plan.

SGLT2 inhibitors

The group of drugs called *sodium glucose co-transporter 2* (SGLT2) inhibitors works by preventing glucose from being reabsorbed by the kidneys so it's excreted in the urine, thereby lowering the blood glucose. These drugs don't cause hypoglycemia but may result in some weight loss and decreased blood pressure. They can reduce the A1C by 0.7 to 0.9 percent. Don't use them during pregnancy or when breastfeeding.

Their dosage must be decreased if you have kidney damage. Because they cause a lot of glucose to spill in the urine, they may cause urinary tract infections, increased urination, and yeast infections of the genital areas, especially in women. They can also cause some dehydration and low blood pressure with possible dizziness or fainting. They're not advised if there's a risk of diabetic ketoacidosis (see Chapter 4). Despite being relatively new, their effectiveness, safety, and added benefits have made them widely prescribed already. The four currently on the market are

- **Canagliflozin (brand name Invokana):** Canagliflozin was the first in this group approved by the FDA in 2013. It comes in 100 mg and 300 mg. The starting dose is 100 mg before the first meal. It's also available with metformin as Invokamet.

- **Dapagliflozin (brand name Farxiga):** Released by the FDA in January 2014, dapagliflozin comes in 5 mg and 10 mg, and treatment starts at 5 mg. There's little clinical difference between dapagliflozin and canagliflozin. It also comes with metformin as Xigduo XR.
- **Empagliflozin (brand name Jardiance):** This was released by the FDA in August 2014. It comes as 10 mg and 25 mg tablets, and the starting dose is 10 mg. Its actions appear to be identical to the previously mentioned SGLT2 inhibitors.
- **Ertugliflozin (brand name Steglatro):** This drug was introduced in 2018. It comes in strengths of 5 mg and 15 mg.

The good news about this group of medications is that it's been shown not only to treat type 2 diabetes successfully but also have an added benefit in reducing the risk of major cardiovascular events in patients who take them. This was summarized in an analysis of all the trials published in *JAMA Cardiology* in 2020 where an event was defined as a heart attack, stroke, or death due to heart disease. A further review published in *The Lancet* in 2021 showed particular benefits in reduction of the risk of worsening heart failure with diabetes. For this reason, the UK NICE guidelines advise that an SGLT2 inhibitor is routinely used alongside metformin in patients who have established heart disease or heart failure or whose risk of heart disease is raised for other reasons. If the first-line drug metformin is contraindicated or not tolerated, then these medications have become the first-line choice in type 2 diabetes.

TIP

Because the term *SGLT2 inhibitor* can be a bit of a mouthful, these drugs are often known as "gliflozins" or just "flozins" because this is the chemical name for this class of medication

Thiazolidinediones

This group of drugs for diabetes is the first type of medication that directly reverses insulin resistance.

ROSIGLITAZONE

Rosiglitazone was the second thiazolidinedione to be approved by the FDA. GlaxoSmithKline markets it as Avandia. Rosiglitazone has the following properties:

- It's available as 2 mg, 4 mg, and 8 mg tablets.
- Tablets are taken with or without food once a day.

- The recommended starting dose is 4 mg, and 8 mg is the maximum starting dose. Increases in the dose are made no more often than every two to four weeks. Rosiglitazone may take three months or longer to have its maximum effect.
- Because it improves insulin resistance, this drug has its greatest effect on the blood glucose after eating rather than the first morning glucose.
- By itself, rosiglitazone doesn't cause hypoglycemia. It results in hypoglycemia only when combined with insulin or sulfonylurea.
- If rosiglitazone is given to a patient on sulfonylurea or metformin, those drugs must not be stopped when rosiglitazone is started because it takes so long to work.
- Rosiglitazone is *insulin sparing,* meaning the body doesn't have to make as much insulin to control the blood glucose. It and pioglitazone, which we discuss in the next section, may have their best use in the most insulin-resistant patients, identified by increased waist circumference, low HDL cholesterol, and fatty liver.
- The drug is eliminated from the body through the bowels, so no adjustment of the dose is needed when the kidneys are poorly functioning.

The following problems are associated with the drug:

- It causes water retention and swelling of the ankles, especially in the older population. The water retention may also be responsible for a mild decrease in red blood cells. People with heart failure shouldn't take it.
- Some infertile women find they become more fertile on rosiglitazone. It may cause unintended pregnancies.
- It's associated with an increased risk of fractures in women, especially older than age 65.

WARNING

Rosiglitazone has been the subject of much controversy over the years. Concerns that it may increase the risk of heart complications following a publication in the *New England Journal of Medicine* in 2010 led the European Medicines Agency to recommend its use be suspended. There was subsequently no reapplication for licensing, and it has been withdrawn from sale in countries including the United Kingdom, New Zealand, and South Africa. Following a review of the apparently conflicting evidence, the FDA has permitted its continued use in the United States, lifting restrictions it placed on sales while further evidence was considered. We always recommend that you talk to your doctor about the benefits and risks of any medication and that you don't start or stop any medication without consulting your them.

PIOGLITAZONE

Pioglitazone, manufactured by Eli Lilly and Takeda in the United States, was the third thiazolidinedione to come to market. The brand name is Actos, and it has the following properties:

- The initial dose is 15 mg once a day with or without food, but most patients require 30 mg or even 45 mg. It comes in all three sizes.
- In addition to restoring fertility in some women who are infertile due to insulin resistance, pioglitazone reduces estrogen levels in women taking estrogen and may result in making hormone-based contraception, such as birth-control pills or Depo-Provera, less effective.
- Pioglitazone has been shown to reduce bad (LDL) cholesterol particles in people with or without diabetes (as reported in *Diabetes Care,* September 2003).
- Pioglitazone has been shown to be associated with increased osteoporosis in women.
- Pioglitazone hasn't been shown to be associated with a higher incidence of heart attacks.
- It's authorized for use alone, with insulin, with metformin, or with a sulfonylurea.

WARNING

Pioglitazone, like rosiglitazone, has been associated with decreased bone mineral density and increased fractures in older women. After 18 months of treatment with pioglitazone, patients have a two or three times greater risk of a fracture than people who never used the drug. The fractures occur especially in the hip or wrist. Pioglitazone has also been found to cause or worsen heart failure (which is why it's contraindicated for use in patients with heart failure) and has been associated with increased bladder cancer.

Pioglitazone 30 mg has been combined with glimepiride 2 mg or 4 mg in a pill called Duetact made by Takeda.

TIP

Because the term *thiazolidinedione* can be a bit of a mouthful, these drugs are often known as "TZDs" or "glitazones."

TROGLITAZONE

Troglitazone, brand name Rezulin (called Prelay outside the United States), was the first oral agent for type 2 diabetes that actually reversed the basic lesion in this disease, namely the insulin resistance. It does so by causing changes within the muscle and fat cells where the insulin resistance resides. These changes take several weeks to occur, and if the patient stops taking troglitazone, they take several weeks to subside.

In March 2000, because of continuing occurrences of severe liver disease sometimes leading to death in a small number of patients taking troglitazone, the FDA removed troglitazone from the market. The other glitazone drugs currently on the market haven't had this problem, although the FDA requires monitoring the patient's liver function when these drugs are first used.

DPP-4 inhibitors

This class of drugs has a different mechanism from any of the previous classes of oral agents. They affect a hormone called *glucagon-like peptide-1* (GLP-1), which is made in the small intestine and has a number of positive effects for people with diabetes:

- It slows the movement of food in the intestine.
- It reduces the production of glucagon from the pancreas. Glucagon raises the blood glucose.
- It increases insulin levels.
- It decreases food intake (by decreasing appetite), leading to weight loss.
- It normalizes the blood glucose in many patients.

The only problem with GLP-1 is that an enzyme called *dipepdipyl peptidase-4* (DPP-4) rapidly breaks it down. Therefore, under usual circumstances, GLP-1 isn't around long enough to have these effects in a major way.

GLP-1 is of interest to researchers looking at the ways in which foods influence glucose levels. In the past, it has been assumed that the carbohydrate we eat is the only factor that affects blood glucose, but it's now possible to show that bioactive compounds such as polyphenols in foods (see Chapter 8) can act to influence insulin hormones such as GLP-1 and insulin.

The class of drugs called DPP-4 inhibitors blocks the rapid breakdown of GLP-1 and prolongs its actions. They cause hypoglycemia when used with sulfonylureas, so the

dose of the latter drug is usually reduced. They reduce the hemoglobin A1C about the same as the sulfonylureas but less than metformin. Over the long term, they've been found to reduce atherosclerosis and inflammation, a deterrent to heart disease. The kidneys excrete them, so their dosage has to be reduced when kidney disease is present, with the exception of linagliptin (see later in this section).

Currently, five DPP-4 inhibitors are on the market:

- **Sitagliptin (brand name Januvia):** Approved in 2006, this Merck drug comes in 25 mg, 50 mg, and 100 mg. The dose is 100 mg daily. Because the kidneys excrete this drug, people with kidney disease must take lower doses. It can cause stomach discomfort. It can be taken in combination with a sulfonylurea, metformin, or insulin.

  The problem with sitagliptin is that the amount of lowering of the hemoglobin A1C is less than 1 percent. In addition, it doesn't result in weight loss, which, we believe, is the major advantage of GLP-1.

  Sitagliptin is available in combinations as the following drugs:

  - Janumet, containing 50 mg of sitagliptin and 1,000 mg of metformin or 50/500
  - Juvisync, containing 100 mg of sitagliptin and 10 mg of simvastatin or 100/20 or 100/40

- **Saxagliptin (brand name Onglyza):** Saxagliptin was approved in 2009. It comes as 2.5 mg and 5 mg tablets. The recommended dose is 2.5 mg or 5 mg once daily. It may be given with a sulfonylurea, metformin, or insulin.

  Saxagliptin is available in combination with extended-release (XR) metformin as Kombiglyze XR, containing 2.5 mg saxagliptin and 1,000 mg metformin or 5 mg saxagliptin and 500 mg or 1,000 mg metformin.

- **Linagliptin (brand name Tradjenta):** This drug was approved in 2011. It comes as 5 mg tablets, and the recommended dosage is 5 mg once daily. It may be used in the same combinations as the other DPP-4 inhibitors. At the end of January 2012, the FDA approved a combination of linagliptin 2.5 mg and metformin, either 500 mg or 1,000 mg, which is called Jentadueto.

- **Vildagliptin (brand name Galvus):** Vildagliptin comes in 50 mg tablets, and the recommended dose is 50 mg twice daily. It isn't recommended for pregnant or breastfeeding women. Eucreas is a mixture of vildagliptin and metformin.

- **Alogliptin (brand name Nesina):** Nesina comes in 6.25 mg, 12.5 mg, and 25 mg. The recommended dose is 25 mg once daily. The smaller tablets are for people with kidney problems. It shouldn't be used in pregnant or nursing women. Alogliptin is available as Kazano with metformin and as Oseni with pioglitazone.

Only one head-to-head trial of the DPP-4 inhibitors — saxagliptin versus sitagliptin — has been done. The two drugs were found to have the same potency.

TIP

Because the term "DPP-4 Inhibitor" can be a bit of a mouthful, these drugs are often known as "gliptins."

Meglitinides

Each of the drugs in the meglitinides group has about the same activity, although they're chemically somewhat different. They're chemically unrelated to the sulfonylureas but work by squeezing more insulin out of the pancreas just like the sulfonylureas do. They're taken just before meals to stimulate insulin for only that meal.

Following are the two drugs in this class:

- **Repaglinide (brand name Prandin):** This medication was the first meglitinide. Here are the characteristics of repaglinide:
  - It is available as 0.5 mg, 1 mg, and 2 mg tablets and is taken just before or up to 30 minutes before meals.
  - The starting dose is 0.5 mg with a mild elevation of blood glucose or 1 mg or 2 mg if the initial blood glucose is higher. The dose may be doubled once a week to a maximum of 4 mg before meals.
  - Because it acts through insulin, repaglinide can cause hypoglycemia.
  - It's not recommended during pregnancy or for nursing mothers.
  - It's not used with the sulfonylureas but can be combined with metformin.
  - Repaglinide lowers the blood glucose and the hemoglobin A1C effectively when used in combination with metformin.

    A combination of repaglinide and metformin is called PrandiMet, and it has two strengths, 1 mg or 2 mg of repaglinide plus 500 mg of metformin. It's taken two or three times daily, 15 to 30 minutes before meals.
  - It's mostly broken down in the liver and leaves the body in the bowel movement. Therefore, if liver disease is present, the dose has to be adjusted downward.
  - Despite the lack of excretion through the kidneys, increases in the dose have to be made more carefully when kidney impairment is present.
- **Nateglinide (brand name Starlix):** This drug is very similar to repaglinide in its activity. However, it comes in 60 mg and 120 mg. The starting dose is usually 120 mg before each meal; if a meal is skipped, no dose is taken. If

hypoglycemia occurs, the dose is lowered to 60 mg. The features of repaglinide also apply to nateglinide, other than the dosage. A report in *Diabetes Care* in July 2003 showed that repaglinide combined with metformin is a more potent combination than nateglinide with metformin.

Both Nateglinide and repaglinide are available as generics in the United States.

Alpha-glucosidase inhibitors

Alpha-glucosidase inhibitors are drugs that block the action of an enzyme in the intestine that breaks down complex carbohydrates into simple sugars that can be absorbed. Taking alpha-glucosidase inhibitors results in a slowing of the rise in glucose after meals. The carbohydrates are eventually broken down by bacteria lower down in the intestine, producing a lot of gas, abdominal pain, and diarrhea — the main drawbacks of these drugs.

The following two alpha-glucosidase inhibitors are currently being used:

- **Acarbose (brand name Precose or Glucobay):** This drug seems to have much greater popularity in Europe than it does in the United States. It was the first alpha-glucosidase inhibitor on the market. Following are its main characteristics:
  - It's supplied in 25 mg, 50 mg, and 100 mg strengths. The recommended starting dose is 25 mg at the beginning of each meal. This dose can be increased to 50 mg or 100 mg three times daily, depending on the blood glucose. The highest dose isn't given unless the patient weighs more than 130 pounds.
  - It doesn't require insulin for its activity, so it works for both type 1 and type 2 diabetes.
  - It doesn't cause hypoglycemia when used alone but does in combination with sulfonylureas. If hypoglycemia is persistent, the dose of sulfonylurea is decreased.
  - It shouldn't be used by people with intestinal disease.
  - Many people don't like it because of the gastrointestinal effects.
  - The lowering of glucose and hemoglobin A1C is modest at most.
- **Miglitol (brand name Glyset):** This medication was the second alpha-glucosidase inhibitor introduced. Its characteristics are identical to acarbose. It comes in 25 mg, 50 mg, and 100 mg. Curiously, Bayer is the manufacturer of both drugs.

TIP

Because these drugs block the breakdown of complex carbohydrates, hypoglycemia occurring with acarbose or miglitol and sulfonylurea combinations must be treated with a preparation of glucose, not more complex carbohydrates.

Bile acid sequestrants

Bile acid sequestrants are drugs that are used to reduce the total cholesterol and the LDL cholesterol. When they were being used for that purpose, it was noted that they also lowered the blood glucose and the hemoglobin A1C. Although the lowering of hemoglobin A1C is modest, about 0.5 percent, these drugs may have a place in prediabetes or mild type 2 diabetes. They don't cause hypoglycemia.

The FDA has authorized the use of colesevelam (brand name Welchol) for this treatment. It can be used for both type 1 and type 2 diabetes. Side effects include constipation and nausea. Colesevelam comes as 625 mg tablets as well as 1,875 mg and 3,750 mg powder packets. The dose is 3,750 mg once daily. It may be used alone or with other oral hypoglycemic agents and doesn't cause weight gain.

Bromocriptine

Bromocriptine is another drug long used for a different illness that has been found to have glucose-lowering effects. It has been used to treat Parkinson's and to treat brain tumors that produce too much growth hormone or prolactin. It was discovered to lower the blood glucose and the hemoglobin A1C to a slightly greater extent (hemoglobin A1C reduced 0.6–0.7 percent) than the bile acid sequestrants but by a different mechanism. It also reduces triglycerides and free fatty acids without causing hypoglycemia or weight gain.

Side effects include nausea, dizziness, and headache in less than 15 percent of patients. The dose of bromocriptine (called Cycloset) is one 0.8 mg tablet increased by one tablet per week up to a maximum of 4.8 mg. It may be used by itself or with other oral agents. The generic version of bromocriptine doesn't work for people with diabetes.

Combining oral agents

Taking one oral agent alone often doesn't control the blood glucose sufficiently to prevent complications of diabetes. (A hemoglobin A1C of less than 7 percent is the goal; see Chapter 7.) In this section, we explain how you can use two or more of these drugs together.

REMEMBER

You should never take a drug, or a combination of drugs, as a convenient way of avoiding the basic diet and exercise that are the keys to diabetic control. (See Chapters 8 and 11 for more information on these crucial points.)

If your diagnosis is made when you need immediate control of symptomatic hyperglycemia, your doctor may choose a period on insulin or using a drug that reduces your glucose level quite quickly. In most situations, doctors will introduce medications gradually if lifestyle measures alone haven't been sufficiently successful to reduce the HbA1C to target levels. Usually, they may introduce one or two medications in succession and even a third may be required (*mono-*, *dual*, or *triple* therapy), though by this time, you'll probably be considered for insulin therapy.

The drugs in this chapter are ordered approximately by their frequency of prescription, though this tends to vary depending on the country you live in. For example, in Europe, the sulfonylureas are being used less frequently nowadays, and only one glitazone is widely available. Guidelines in the U.K. currently advise (depending on tolerability and if there are no contraindications) the use of metformin first line, with the addition of an SGLT2 inhibitor ("flozin") especially if there's a risk of heart disease. If the addition of a third medication where possible — such as a DPP-4 inhibitor ("gliptin"), a thiazolidinedione ("glitazone"), or a sulfonylurea — still doesn't achieve the desired HbA1C target, then you and your doctor need to consider injectable medications, including insulin.

TIP

Whichever medication or medications you and your doctor choose, make sure that you're aware of any possible side effects, particularly if any of them increase the risk of hypoglycemia or ketoacidosis. Ask your doctor about how to look out for these effects and make sure that you tell them about any special diet you may be on. For example, following a very low-carbohydrate/ketogenic diet may increase the risk of ketoacidosis.

New injectable drugs

In the earlier discussion of DPP-4 inhibitors, we mention that those drugs work by blocking the breakdown of the natural hormone GLP-1. The effects of GLP-1, such as increasing the secretion of insulin and decreasing the uptake of glucose, have been called the incretin effect. The *incretin effect* includes slow emptying of the stomach with an early sensation of fullness. They often cause weight loss. Recent studies suggest that the incretin effect is lost early in type 2 diabetes. Because incretins have been shown to preserve beta-cell function, some experts believe they should be used early in the treatment of type 2 diabetes, but they aren't yet recommended for initial treatment. The following sections introduce you to several forms of GLP-1 that are in use.

All the drugs in this group shouldn't be given to anyone with medullary thyroid cancer and shouldn't be given to pregnant or nursing women. They can't be used

in type 1 diabetes because insulin production is mostly gone with that condition. The kidneys don't excrete these drugs, so their dose doesn't have to be changed with kidney disease.

EXENATIDE

Amylin Pharmaceuticals and Eli Lilly have been able to extract a substance from the venom of a lizard called the Gila monster that acts like GLP-1 but doesn't break down nearly as fast. This substance is used in the medication exenatide (trade name Byetta). The pharmaceutical companies have also been able to produce a second injectable substance called *pramlintide* with many similar properties.

Exenatide is a powerful form of GLP-1 that lasts for several hours. It's taken within an hour before breakfast and dinner. It may be used only in type 2 diabetes and comes in pens containing either 5 or 10 mcg per dose. It may be used with metformin or a sulfonylurea or combinations of those drugs. It can sometimes cause substantial weight loss and eliminate the need for all of those drugs. It's associated with nausea, and, in rare cases, it can't be used because the nausea is so severe. Hypoglycemia is frequent when it's used with a sulfonylurea. The dosage of the sulfonylurea is then reduced. At present, it may be used with long-acting insulin but not short-acting or rapid-acting insulin.

Exenatide has been found to be linked to pancreatitis (true for all GLP-agonists), an inflammation of the pancreas that causes abdominal pain, nausea, and vomiting and can be fatal. Whether and how exenatide may cause pancreatitis isn't clear.

TIP

Serious and life-threatening cases of ketoacidosis have been reported in people using these medications with insulin, particularly if the dose of insulin is reduced rapidly. Careful monitoring and supervision is always recommended when adding medications or adjusting doses up or down.

LIRAGLUTIDE

Liraglutide (brand name Victoza) is another form of GLP-1. Liraglutide can be injected once a day without relation to meals. It has been shown to lower the hemoglobin A1C to a greater extent than twice-daily exenatide. It also causes more weight loss, increased reduction in fasting plasma glucose, and more blood pressure lowering. Nausea is a minor side effect.

Liraglutide is started at a dose of 0.6 mg by injection and raised to 1.8 mg daily over two weeks.

Liraglutide has been associated with tumors of the thyroid gland in animals but not humans.

EXTENDED-RELEASE EXENATIDE

In January 2012, the FDA approved once-weekly extended-release exenatide (brand name Bydureon). It's more effective than twice-daily exenatide but has about the same potency as daily liraglutide. The obvious advantage is 1 injection a week instead of 14.

PRAMLINTIDE

Pramlintide (brand name Symlin) is an extract from the same beta cells of the pancreas that produce insulin. The hormone in its natural state in the body is called *amylin*. It has a number of valuable properties for type 1 and type 2 diabetes, including the following:

- It blocks the secretion of glucagon, a major hormone that tends to raise blood glucose (see Chapter 2 for details).
- It slows the emptying of the stomach so that glucose is absorbed more slowly.
- It causes loss of appetite and weight loss.

Pramlintide, therefore, has an important effect on the rate at which glucose appears in the blood after eating. These effects occur when pramlintide reaches certain centers in the brain.

Because amylin comes from the same cells that make insulin, it's absent in type 1 diabetes just as insulin is absent in type 1 diabetes. It was thought that providing amylin to a patient with type 1 diabetes may improve the blood glucose. However, naturally occurring amylin has chemical properties that make it unusable as a pill or an injection. Mainly, it couldn't be made to dissolve in any liquid. A small change in the chemical structure made it possible to dissolve the new chemical while retaining all the properties of amylin.

Pramlintide is taken before meals that contain at least 30 grams of carbohydrate or 250 kilocalories. It doesn't mix with insulin. Because pramlintide is so potent, the insulin dose must be reduced. It can cause nausea and hypoglycemia.

The starting dose of pramlintide for type 1 diabetes is 15 mcg before meals, and it's increased by 15 mcg every three days. The maximum daily total dose is 180 mcg. For type 2 diabetes, the starting dose is 60 mcg before major meals, and it can be increased to 120 mcg if necessary.

Pramlintide hasn't been studied in pregnancy or while breastfeeding, so it shouldn't be used in these situations. Children may use it.

WARNING

You should probably not use pramlintide if you have hypoglycemia unawareness (see Chapter 4) or a form of diabetic neuropathy called gastroparesis (see Chapter 5), which makes the stomach empty slowly.

LIXISENATIDE

Licensed in the United States in 2016, this is another daily injectable in the same class. Its brand name is Adlyxin.

OTHER INJECTABLE DRUGS

Here are a few other injectable drugs available on the market:

- **Albiglutide (brand name Tanzeum):** Albiglutide is injected once a week under the skin, without regard to meals. The starting dose is 30 mg, but it can be raised to 50 mg. It comes in a single dose pen. It differs little from liraglutide.
- **Dulaglutide (brand name Trulicity):** This is yet another once-weekly GLP-1. It's available as 0.75 mg and 1.75 mg single-dose injection pen or a single-dose prefilled syringe.
- **Semaglutide (brand names Ozempic and Rybelsus):** This option is similar to dulaglutide (Trulicity)and was licensed in 2017. This medication has been used recently as a means to lose weight for people who don't necessarily have a diagnosis with diabetes. We caution against the use of medication for weight loss; read more in Chapter 8.
- **Terzepatide (brand name Mounjaro):** This weekly injectable medication was licensed in the United States in May 2022. This is an exciting new development because it improves diabetes control and reduces weight through actions not only on GLP-1 but also on another hormone receptor controlling glucose metabolism called the *glucose-dependent or gastric insulinotropic polypeptide* (GIP). This makes it the first dual GIP and GLP-1 receptor agonist to be marketed, with hopes of even better diabetes control.

Taking Insulin

If you have type 1 diabetes, insulin is your savior. If you have type 2 diabetes, you may need insulin at some point in the course of your disease. Insulin is a great drug, but most people take it through a needle, and that's the rub (or the pain). Inventors have come up with many different ways to administer insulin, but using a syringe and a needle has been the standard for so long that most patients

continue to do so. In this section, we tell you about the newer methods, which you should at least consider because they're easier and possibly more accurate than the old method. However, the new syringes and needles are just about painless.

Until a few years ago, insulin could be obtained only by extracting it from the pancreas of a cow, pig, salmon, or some other animal. This wasn't entirely satisfactory because those insulins are slightly different from human insulin.

Using them resulted in an immune reaction in the blood and certain skin reactions. The preparation was purified, but tiny amounts of impurities always remained. In 1978, researchers were able to trick bacteria called *coli* into making human insulin. Almost all insulin is now perfectly pure human insulin. Soon, no insulin besides human insulin will be available.

Considering insulin options

In the human body, insulin is constantly responding to ups and downs in the blood glucose. To make many injections a day unnecessary, forms of insulin were invented to work at different times. The choice of insulins is an individual decision based on how well your regime will control your diabetes with the lowest risk of side effects (particularly hypoglycemia) and inconvenience in the context of your circumstances. The following list explains the various forms of insulin:

- **Rapid-acting lispro insulin:** Lispro insulin (called *Humalog insulin* by its manufacturer, Eli Lilly) begins to lower the glucose within five minutes after its administration, peaks at about one hour, and is no longer active by about three hours. Lispro is a great advance because it frees the person with diabetes to take an injection just when they eat. With the previous short-acting insulin (regular insulin), a person had to take an injection 30 minutes prior to eating. Because its activity begins and ends so quickly, lispro doesn't cause hypoglycemia as often as the older preparations.

  Novo Nordisk has come out with *insulin aspart* (called NovoLog), which has characteristics indistinguishable from lispro insulin.

  Sanofi-Aventis produces *insulin glulisine* (trade name Apidra), which is similar in its properties to the other two rapid-acting insulins.

- **Short-acting regular insulin:** This form of insulin takes 30 minutes to start to lower the glucose, peaks at three hours, and is gone by six to eight hours. Until Humalog, NovoLog, and Apidra came along, patients used this preparation before meals to keep their glucose low until the next meal.

- **Intermediate-acting NPH:** This drug begins to lower the glucose within 2 hours of administration and continues its activity for 10 to 12 hours. It can

be active for up to 24 hours. The purpose of this kind of insulin is to provide a smooth level of control over half the day so that a low level of active insulin is always in the body — an attempt to parallel the situation that exists in the human body.

- **Long-acting insulin glargine and detemir:** Aventis sells an insulin called *insulin glargine,* which goes by the trade name Lantus. Studies have shown that insulin glargine has its onset in 1 to 2 hours after injection, and its activity lasts for 24 hours without a specific peak time of activity, which is exactly what is needed to control the blood glucose over an entire day. Insulin glargine is released in a smooth fashion from the site of injection, and it doesn't matter if you inject the abdomen, the thigh, or the deltoid. Because of its smooth and predictable activity, insulin glargine doesn't tend to cause low blood glucose at night, which often happens with NPH insulin. However, one disadvantage of insulin glargine is that it can't be mixed with other insulins in one syringe.

  Insulin detemir or Levemir has similar properties to glargine but doesn't last quite as long. It's a product of Novo Nordisk.

  In 2021, the FDA licensed two further insulin formulations that are similar to insulin glargine. These biosimilar products are considered to have equivalent actions to the original drug they're based on and increase competition and choice, which can reduce costs. Semglee (insulin glargine-yfgn) and Rezvoglar (insulin glargine-aglr) are very comparable to insulin glargine (Lantus) though they can't be mixed with other insulins. Pharmacists can sometimes substitute biosimilar products for the original medication without requiring the prescriber's specific authorization, but it's always best to talk with your doctor.

TIP

  If you don't have good diabetic control (defined as hemoglobin A1C of 7 percent or less) with NPH insulin, ask your doctor to consider using insulin glargine or detemir.

- **Premixed insulins:** Premixed insulins are helpful for people who have trouble mixing insulins in one syringe, have poor eyesight, or are stable on a preparation that doesn't change. Insulins that aren't premixed are better for young, fairly stable type 2 diabetics. Several mixtures are available:
  - A mixture of 70 percent NPH insulin and 30 percent regular
  - A 50–50 mix of NPH and regular
  - A 75–25 mix of NPH-like insulin and lispro insulin
  - A 70–30 mix of NPH-like insulin and insulin aspart

TIP

Whichever type of insulin you take, you need to know a few basic things about its use:

- Insulin may be kept at room temperature for four weeks or in the refrigerator until the expiration date printed on the label. After four weeks at room temperature, the insulin should be discarded.
- Insulin doesn't take too well to excessive heat, such as direct sunlight, or to excessive cold. Protect your insulin against these conditions.
- If you take less than 50 units in an injection, you can use ½-cc syringes that make it easy to measure up to 50 units. If you take less than 30 units, you can use $\frac{3}{10}$-cc syringes.
- Shorter needles may be more comfortable, especially for children, but the depth of the injection helps to determine how fast the insulin works.
- Used syringes and needles must be disposed of in a puncture-proof container that is sealed shut before being disposed of according to your pharmacist's advice.

TIP

In February 2015, the FDA approved inhaled insulin called Afrezza from Sanofi and MannKind Corporation. Both type 1 and type 2 diabetes patients can use it. It's a dry powder that's placed in a small, portable inhaler and taken just before meals. It can't be used in acute situations like diabetic ketoacidosis (see Chapter 4) or in people with chronic lung disease. If you really hate needles, ask your doctor if you can give it a try.

COMBINING INSULIN AND ORAL AGENTS IN TYPE 2 DIABETES

Sometimes the characteristics of the currently available oral agents don't provide the tight control needed to avoid complications. This problem is particularly common for people who have lived with type 2 diabetes for many years. In such cases, insulin may be required. Insulin may be added in a number of ways, but often an injection of glargine insulin at bedtime is all that is needed to start the day under control and continue it with oral agents. For example, metformin may control the daytime glucose very well after eating, but the first morning glucose may need the overnight injection of glargine insulin. By gradually increasing the dose of glargine, most patients with type 2 diabetes on oral agents can control their blood sugar levels so that their hemoglobin A1C is 7 or below.

As type 2 diabetes progresses, the oral agents may be less effective, and insulin is taken more often. Two injections a day of intermediate and short-acting insulin may do the trick. Usually, you take two-thirds of the dose in the morning and one-third before dinner because you need short-acting insulin to control the dinner carbohydrates. In this situation, 75 percent protamine lispro (like NPH) and 25 percent lispro insulin may be useful, allowing the patient to measure from only one bottle. This combination is especially valuable in the older person with diabetes, where the tightest level of control isn't being sought because the expected life span of the patient is shorter than the time necessary to develop complications. In this patient, doctors want to prevent problems like frequent urination leading to loss of sleep or vaginal infections, so they give enough to treat this but not so much that a frail, elderly patient is having hypoglycemia on a frequent basis.

Getting used to injections

Whatever type of insulin you use, you may be taking it by syringe and needle. (We discuss other delivery options later in the chapter, in the sections "Delivering insulin with a pen" and "Delivering insulin with an external pump.")

Drawing insulin up is done in the same way no matter which type of insulin is involved. If you look at the syringe in Figure 12-1, you see that it's marked with lines.

Starting at the needle end of the syringe, you'll find nine small lines above the needle, followed by a tenth longer line where the number 10 may be found. Each line is one unit of insulin. Above the 10-unit line, you'll find a succession of four small lines followed by a larger line representing 15, 20, 25, and so on.

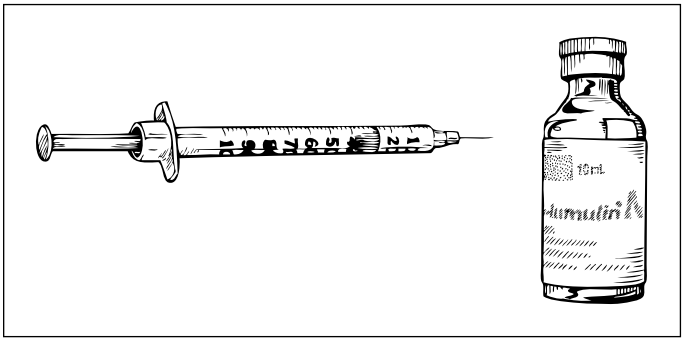

FIGURE 12-1: The insulin syringe and bottle.

Illustration by Kathryn Born

If the insulin is short-acting, long-acting, or regular, the bottle should be clear, and you don't have to shake the bottle. The other kinds of insulin are cloudy, and you need to roll the bottle a few times to suspend the tiny particles in the liquid. A new bottle has a cap on the top, which you break off and discard. When you're ready to take insulin, wipe the rubber stopper in the top of the bottle with alcohol.

Pull up the number of units of air that corresponds to the number of units of insulin you need to take. Turn the insulin bottle upside down and penetrate the rubber stopper with the needle of the syringe. Push all the air inside and pull out the insulin dose you need. Because air replaces the insulin, the pressure inside the bottle is unchanged and no vacuum is created. Check to make sure that you have the correct amount of the right insulin and no air bubbles in the syringe.

To give the injection, use alcohol to wipe off an area of skin where you've been trained to administer it. Insert the needle at a right angle to the skin and push it in. When the needle has penetrated the skin, push the plunger of the syringe down to zero to administer the insulin.

If you're taking two kinds of insulin (but not insulin glargine) at the same time, you can mix them in one syringe, thus avoiding two injections. Here's how you do that:

1. **Wipe both bottles with alcohol.**
2. **Draw up the total units of air corresponding to the total insulin you need.**
3. **Push the units of air into the longer-acting insulin bottle that corresponds to the number of units of longer-acting insulin you need, and withdraw the needle without drawing any insulin.**
4. **Push the rest of the units of air into the shorter-acting insulin bottle, and withdraw the correct units of insulin.**
5. **Go back to the longer-acting bottle and withdraw the correct units of insulin from there.**

By doing this, you don't contaminate the shorter-acting insulin with the additive in the longer-acting insulin.

TIP

Where you inject the insulin helps determine how fast it works. The site that most rapidly absorbs insulin injections is the abdomen, followed by the arms and legs and then the buttocks. You may use these differing rates of uptake of the insulin to get faster action when your blood glucose is high. If the body part that gets the insulin is exercised, the insulin enters more quickly. If you use the same injection site repeatedly, the absorption rate slows down, so rotate the sites.

TIP

The timing of your insulin injections helps determine the smoothness of your glucose control. The more regular you are in your injections, your eating, and your exercise, the smoother your glucose level.

TIP

Using the carbohydrates in a meal to determine your insulin dose is called *carbohydrate counting*. The key to this system is to know the carbohydrates in your food. Here is where you make use of your friendly dietitian, who can go over your food preferences and show you how many carbohydrates are in them. The dietitian can also show you where to find carbohydrate counts for any other foods that you may eat.

You also need to know how many grams of carbohydrate are controlled by each unit of insulin you take. This number is determined by checking your blood glucose an hour after eating a known amount of carbohydrate. For example, one person may need 1 unit to control 20 grams of carbohydrate, whereas another person needs 1 unit to control 15 grams of carbohydrate. If both of them eat a breakfast of 75 grams of carbohydrate, the first person might take 4 units of lispro, whereas the second person takes 5 units of lispro. Then additional units are added for the amount that the blood glucose needs to be lowered.

A typical schedule is to take 1 unit for every 50 mg/dl that the blood glucose is above 100 mg/dl. Insulin can also be subtracted if the blood glucose is too low. For every 50 mg/dl that the glucose is below 100, subtract 1 unit. (To see how carbohydrate counting works in practice, see the sidebar "Carbohydrate counting to maximum health.")

By measuring your blood glucose frequently, you can find out how different carbohydrates affect your blood glucose. By using the carbohydrate sources that have a low glycemic index, you need less insulin to control them. (See Chapter 8 for more on carbohydrates.)

TIP

As you attempt to help your body mirror normal insulin and glucose dynamics, you often have to deal with a greater frequency of hypoglycemia. The best way to handle hypoglycemia is by eating slightly smaller meals and using the unused calories as between-meal snacks. This technique smooths the ups and downs.

ASK THE DOCTOR

At what point do you adjust your insulin glargine? If you find that several mornings in a row your fasting blood glucose is too high, you may add a unit or two to your bedtime glargine. If it's too low, you may reduce your insulin glargine by a unit or two or try eating a small bedtime snack. A high blood glucose level throughout the day is an indication to raise the glargine. Getting a lot of hypoglycemia at different times of day is a reason to lower the glargine. These adjustments are best done in consultation with your doctor. If, however, you're unable to see your doctor, you can put your knowledge to use and make these adjustments on your own.

CARBOHYDRATE COUNTING TO MAXIMUM HEALTH

To find out how you can accomplish carbohydrate counting in everyday life, take a typical type 1 patient. Salvatore Law is a 41-year-old who has had type 1 diabetes for 31 years. He has been well controlled because he follows a good diet, does lots of exercise, and takes his insulin appropriately. He takes 30 units of insulin glargine at bedtime.

Law has a list of dosages of lispro insulin that tells him to take 1 unit of insulin for each 20 grams of carbohydrate he eats. He's about to have breakfast and knows that it will contain 80 grams of carbohydrate. Therefore, he needs four units of lispro insulin. He measures his blood glucose before breakfast and finds that it's 202 mg/dl. His doctor has told him to take an extra unit of lispro insulin for each 50 mg/dl above 100 mg/dl. He adds two more units for a total of six units of insulin taken just before breakfast.

At lunch, his blood glucose measures 58. He's about to have a lunch of 120 grams of carbohydrate, so he needs 6 units for that. However, he reduces it by 1 unit for the glucose measurement that is approximately 50 mg/dl lower than 100, so his final dose is 5 units.

Before dinner, Law's blood glucose measures 120. His dinner contains only 60 grams of carbohydrate, so he needs 3 units for that. He doesn't have to adjust the dose because the glucose is close to 100, so he takes only 3 units.

At bedtime, his blood glucose is 108, so he is doing very well. Unless the blood glucose is 200 or greater, he doesn't need to take any bedtime lispro because he is taking insulin glargine to control his glucose overnight.

Adjusting insulin when you travel

If you're traveling between time zones, you may wonder if you need to change your insulin routine while you're gone. Time changes of less than three hours require no modifications, but changes above three hours require progressively more. You should probably discuss these changes with your physician before you travel.

Say that you're taking the red-eye flight at 10 p.m. from San Francisco, arriving at 6 a.m. at Kennedy Airport in New York. If you're taking insulin glargine or detemir, you don't have to change your dose. Just start using lispro (or any other rapid-acting insulin) at the beginning of your meals (which you'll be eating three hours earlier than usual because of the time change).

When you return to California, you add three hours to your day. In this case, you need to take an extra measurement of your blood glucose. If it's around 150, you

need do nothing, but if it's 200 or more, take a couple of units of lispro insulin to bring it down. If your blood glucose is much below 100, eat a small snack. Again, you don't have to adjust your insulin glargine.

Delivering insulin with a pen

Several manufacturers, including Eli Lilly, Owen Mumford, Diesetronic, Novo Nordisk, Sanofi-Aventis, and Becton Dickinson, have sought ways to make delivering insulin easier. The insulin pen, shown in Figure 12-2, is one useful tool. The pen doesn't eliminate the need for needles, but it does change the way you measure your insulin. Either the pen comes with an insulin cartridge already inserted, or the cartridge is placed inside the pen just like an ink cartridge used to be put in a pen and replaced when it runs out.

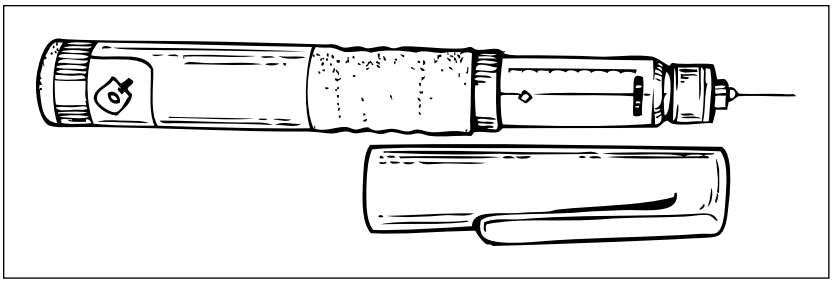

FIGURE 12-2: The insulin pen.

Illustration by Kathryn Born

Each cartridge contains 1.5 ml or 3.0 ml of insulin — either NPH, regular, lispro, aspart, glargine, detemir, a mixture of NPH and lispro (such as 75 percent NPH-like lispro and 25 percent lispro), or a mixture of NPH plus aspart. You can then dial the amount of insulin that you need to take. Each unit (sometimes 2 units) is accompanied by a clicking sound so the visually impaired can hear the number of units. The units also appear in a window on the pen. If you draw up too many units, one of the pens forces you to waste the insulin by pushing it out of the needle, whereas others allow you to reset the pen and start again. Depending on the pen, you can deliver from ½ to 80 units of insulin. You screw on a new needle as needed.

TIP

A number of different companies make pens for their insulin. Available pens include the following options:

- **Autopen:** This pen is available in four different models. Two contain a 1.5 ml cartridge, and two contain a 3 ml cartridge. Within each size, one pen delivers Humalog insulin in 1-unit increments, and the other pen delivers Humalog insulin in 2-unit increments.

- **Humalog Mix 75/25, Humalog Mix 50/50, Humalog KwikPen, Humulin Mix 70/30, and Humulin N:** All these prefilled, disposable pens contain 3 ml of the particular kind of insulin you use.
- **HumaPen Luxura HD:** This pen is used for Humalog insulin when half-unit doses are needed, particularly in children.
- **Levemir FlexTouch Pen:** This prefilled disposable pen contains 3 ml of Levemir insulin.
- **NovoLog FlexPen and NovoLog 70/30 FlexPen:** These prefilled, disposable insulin syringes contain 3 ml of insulin.
- **NovoPen Junior:** This pen takes NovoLog cartridges containing 3 ml of insulin, and they can be measured in half-unit doses.
- **NovoPen 3:** This pen holds NovoLog 3 ml cartridges.
- **SoloStar:** This disposable pen contains 3 ml of Lantus insulin.

You must match the pen with the proper needle for the pen to work properly. If the needles don't come with the pen, the instructions with the pen tell you which needle to use.

Should you shift from your syringe and needle to a pen? If you're comfortable with the syringe and needle and feel your technique is accurate, you probably have no reason to do so. If you're new to insulin, have some visual impairment, or feel that you're not getting an accurate measurement of the insulin, a pen may be the solution for you.

WARNING

In February 2015, the FDA issued a warning against allowing others to use your pen. Even if needles are changed, there may be blood in the pen cartridge that could cause infection of the other user.

Delivering insulin with a jet-injection device

Jet-injection devices (see Figure 11-3) are for people who just can't stick a needle into their skin. At around $1,000 or more, they're expensive, but they last a long time and replace the syringe and needle.

A large quantity of insulin is taken into the injection device, enough for multiple treatments. The amount of insulin to be delivered is measured, usually by rotating one part of the device while the number of units to be delivered appears in a window. The device is held against the skin. With the press of a button, a powerful jet of air forces the insulin through the skin into the subcutaneous tissue, usually with no pain perceived by the patient. The devices come in a lower power form for smaller children. These devices can deliver up to 50 units at one time.

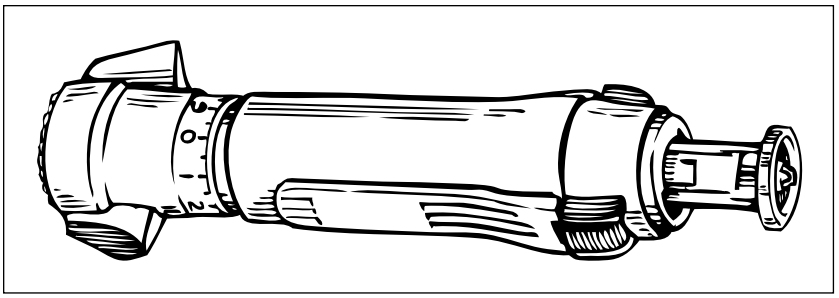

FIGURE 12-3: A jet-injection device.

Illustration by Kathryn Born

Should you try an insulin jet injector? If you have no trouble with the syringe and needle or find the pen to be an easy substitute, you don't need a jet injector. If you hate needles or need to give frequent injections to a small child who is very resistant to them, a jet injector may solve your problems. Insulin jet injection devices have been shown to be more effective than pens in a study of people with type 2 diabetes published in *Medicine* (Baltimore) in 2017, but their use remains uncommon and it can be difficult to find supplies.

Delivering insulin with an external pump

For some people — and you may be one of them — the external insulin pump (see Figure 11-4) is the best solution. These devices are as close as you currently can come to the gradual administration of rapid-acting insulin that is normally taking place in the body. They're expensive, but the insulin pump may be the answer for patients who simply can't achieve good glucose control with syringes, pens, or jet injectors.

Hour-by-hour control of blood glucose with pump-delivered insulin is usually appropriate only for people with type 1 diabetes who lack insulin, rather than for the insulin resistance seen in people with type 2 diabetes. Type 2 diabetes can usually be controlled with diet and lifestyle advice, mono-, dual-, or triple-drug therapy, or finally with one or more daily insulin injections to reduce the HbA1C to levels that prevent complications. In some countries with universal healthcare funded through taxation, insulin pumps are reserved for people with type 1 diabetes only, due to decisions based on cost effectiveness.

Inside the pump is a motor. A syringe filled with short-acting insulin is placed within the pump, with the plunger against a screw that slowly pushes it down to push insulin out of the syringe. The end of the syringe is attached to a short tube, which ends in a needle pushed into the skin of the abdomen. Insulin is slowly pushed under the skin.

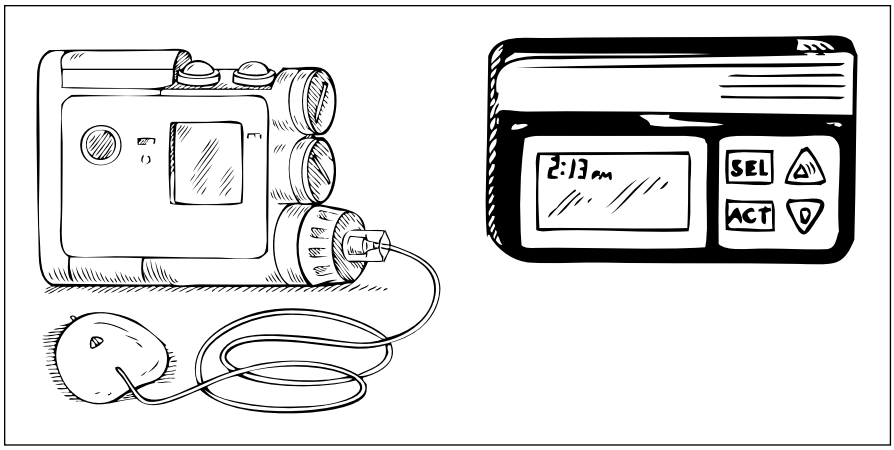

FIGURE 12-4: The insulin pump with its infusion set.

Illustration by Kathryn Born

The rate at which insulin slowly enters under the skin is called the *basal rate.* It can be set, by way of computer chips, to vary as often as every half hour to an hour. For example, from 8 a.m. to 9 a.m., the pump may deliver 0.8 units, whereas from 9 a.m. to 10 a.m., the pump may deliver 1.0 unit, depending on the needs of the patient. This amount is determined, of course, by measuring the blood glucose with a meter (see Chapter 7).

When the individual is about to eat a meal, they can push a button to deliver extra insulin, called a *bolus* of insulin. (The amount is determined by carbohydrate counting, which we explain earlier in this chapter.) You can get extra insulin if the blood glucose is too high at any time.

Pump usage has its advantages:

- It's flexible because the bolus is taken just before meals.
- It often smooths out the swings of glucose during the day because the insulin is administered slowly and in small variable doses, depending on insulin requirements at different times of day.
- It can be rapidly disconnected and reconnected to take a shower or swim. (However, it can take a little getting used to when worn to bed.) Or insulin delivery can be suspended during exercise to prevent hypoglycemia after exercise.
- It's safe from overdosage because it has built-in protective devices.

However, pump usage has definite disadvantages besides the high cost:

- Infections of the skin are frequent because the infusion set is left in place for several days. These infections are usually mild, however.
- Overall diabetic control isn't necessarily better with the pump than with other ways of delivering insulin, especially with insulin glargine. The latest proof of this was an article published in *Journal of Diabetes and Its Complications* in November 2010.
- Because the patient receives only short-acting insulin, if insulin stops entering, ketoacidosis may come on rapidly (see Chapter 4).
- Some patients are allergic to the tape that holds the infusion set onto the skin.
- Blood glucose must be measured often to adjust the pump for optimal control.

REMEMBER

Pump usage is definitely not treatment to be done on your own at the beginning. You need a diabetologist to help with dosages, a dietitian to help you calculate amounts of boluses based on carbohydrate intake, and someone from the manufacturer to teach you how to set the pump and to be available to fix any malfunctions.

If you use a pump and your blood glucose rises above 250 mg/dl, take the following steps:

1. **Take a bolus of insulin with the pump to bring it down.**

   The amount is determined by your sensitivity to insulin.
2. **Recheck your glucose in an hour.**
3. **If the glucose is still above 250 mg/dl, use a syringe to take more insulin.**
4. **Check your infusion set.**
5. **Check the ketones in your urine and report to a doctor if the amount is moderate to large.**
6. **Recheck your glucose every two hours and use more insulin as needed.**

Is an insulin pump for you? If you're willing to invest the time and effort at first, if your schedule is very uncertain, particularly with respect to meals, and if your glucose control has not been good with other means, you should look into this option — but only if your specialist doctor recommends it for your diabetes and it's available and affordable.

Do we recommend using an insulin pump? With insulin glargine, you can accomplish a continuous basal control of the blood glucose much like the pump does.

The pump proponents say that you need to be able to alter the basal dose for different conditions throughout the day, and you can't do that with a single injection of insulin. However, we're not sure that it makes a great difference in the course of controlling the blood glucose.

Is one pump better than another? All seem to have excellent mechanical features, and all provide you with the ability to adjust your insulin in several ways. They all have alarms for any eventuality like blockage of the tube, an electrical failure, and so forth. They try to differentiate themselves by offering different options for how the insulin is delivered, but you may find that you need the help of a rocket scientist to figure out those differences.

It's possible to get even closer to "real-time" control with a pump connected to a blood glucose monitor. Readings taken by the monitor are wirelessly sent to the pump, which uses a software program to calculate the bolus of insulin to be given, taking into account the carbohydrates about to be eaten, which you must enter into the pump. The wearer must accept the bolus before it's delivered. This product is just short of the so-called *closed loop system*, where the blood glucose determines the amount of insulin to be given, just as the normal pancreas is constantly doing. The pump chooses the boluses, but it doesn't constantly alter the basal level of insulin because no continuing information about the current blood glucose level is given. The wearer must test the blood glucose with the meter for the pump to know glucose levels.

Utilizing aids to insulin delivery

Those people still using the needle-and-syringe method should be aware of numerous aids that can make taking insulin easier:

TIP

- **Spring-loaded syringe holders:** You place your syringe in the holder, hold it against the skin, and press a button. The needle enters and administers the insulin. Examples are Inject-Ease and Autoject 2.
- **Syringe magnifiers:** These magnifiers help visually impaired people administer insulin. Examples are Insul-eze, BD Magniguide, and Syringe Magnifier by Apothecary.
- **Syringe-filling devices:** You can feel and hear a click as you take up insulin. An example is Count-A-Dose.
- **Subcutaneous infusion sets:** A catheter is placed under the skin, and injections are made into the catheter instead of the skin to reduce punctures. Many units are available.

» **Needle guides:** You can use these guides when you can't see the rubber part of the insulin bottle to insert the needle to take up the insulin. An example is Safe Shot.

Call your local American Diabetes Association (ADA) branch or look in the back of the ADA's *Diabetes Forecast* magazine to find sources for these products.

REMEMBER

If you take a drug that makes you prone to hypoglycemia, you need to wear a medical bracelet or necklace that identifies you as a person with diabetes who may be hypoglycemic. Numerous companies make these products.

Using Herbs, Supplements, and Other Medications

In Chapter 8 we discussed the profound effect of foods which can positively affect glucose metabolism. It has been shown that individual ingredients of a healthy diet such as The Mediterranean Diet can regulate blood glucose and affect insulin sensitivity. Herbs and supplements may be promoted for providing these benefits. Many health food shops offer supplements with claims that they can help diabetes control.

The following are examples of some of the plants and natural products that have been studied for their potential beneficial effects on glucose metabolism;aloe, banaba extract, bergamot, bitter melon, caper, cinnamon (pure form), cocoa, coffee, fenugreek, garlic, guava, gymnema, nettle, sage, soybean, green and black tea, turmeric, walnuts, and yerba mate. Sometimes the evidence is based on rigorous scientific studies, but on occasions there is much less data to support their use. It is advisable to discuss such supplements with your doctor and if you introduce them, closely monitor any effect they may have on your glucose levels, because they may alter the dose of medications that you require.

TIP

Most of this chapter is devoted to medications that lower the blood glucose, but diabetes involves more than elevated blood glucose levels. People with diabetes often have high blood pressure and high cholesterol, and they suffer more sickness when exposed to COVID-19, influenza, or pneumonia. You need to consider this fact in the overall management of your disease.

If you have high blood pressure (see Chapter 7), then lifestyle changes, including weight management and physical activity, may be all you need to control the condition. However, if lifestyle changes alone don't work, numerous medications are available that control blood pressure.

Most people with diabetes also have elevated levels of LDL (bad) cholesterol (see Chapter 7). Excellent drugs are available to manage this problem if lifestyle changes don't suffice. Cholesterol control is another cornerstone of excellent diabetic care.

TIP

Statin drugs are the most frequently used for lowering LDL cholesterol. However, statin use in some people may be associated with an increased risk for type 2 diabetes, so discuss it with your doctor.

People with diabetes, especially those whose glucose is poorly controlled, are prone to become sicker when they develop COVID-19, influenza, or pneumonia. Excellent vaccinations for these illnesses are available. In 2011, the Advisory Committee on Immunization Practices at the Centers for Disease Control recommended that all unvaccinated adults with diabetes aged 19 to 60 be vaccinated against hepatitis B virus as soon as a diagnosis of diabetes is made. Those individuals 60 and older should be vaccinated if they're expected to have a satisfactory immune response.

Finally, aspirin has been shown to reduce sickness and death due to coronary artery disease (which we discuss in Chapter 5). Because coronary artery disease is such a prominent feature of diabetes, many doctors recommend that all patients with diabetes take a daily aspirin tablet. However, the American Diabetes Association and the U.K.'s National Institute for Health and Care Excellence don't recommend it for diabetics at low risk of a heart attack.

Avoiding Drug Interactions

Studies have shown that some patients with diabetes are taking as many as four to five drugs, including their diabetes medications. These drugs often interact, and the results can be harmful. Sometimes (believe it or not) even your doctor isn't aware of the interactions of common drugs. You need to know the names of all the drugs you take and whether they affect one another.

Many common medications used for the treatment of high blood pressure raise the blood glucose, sometimes bringing out a diabetic tendency that may otherwise not have been recognized, such as the following:

- Thiazide diuretics often raise the glucose by causing a loss of potassium. Among these drugs are chlorothiazide (Diuril) and metolazone (Zaroxolyn), which are similar to hydrochlorothiazide.
- Beta blockers reduce the release of insulin and include such drugs as propranolol (Inderal), metoprolol (Lopressor), and atenolol (Tenormin).

- Calcium channel blockers also reduce insulin secretion. They include nifedipine (Adalat), verapamil (Calan), diltiazem (Cardizem), verapamil (Isoptin), amlodipine (Norvasc), and nifedipine (Procardia).
- Minoxidil can raise blood glucose.

Drugs used for other purposes can also raise blood glucose:

- Corticosteroids, even in topical use, can raise blood glucose.
- Cyclosporine, used to prevent organ rejection, can raise the blood glucose by poisoning the insulin-producing beta cell.
- Diphenylhydantoin, known as Dilantin, is a drug for seizures and blocks insulin release.
- Nicotinic acid and niacin, used to raise HDL and lower cholesterol, can bring out a hyperglycemic tendency.
- Phenothiazines, such as prochlorperazine (Compazine), mesoridazine (Serentil), trifluoperazine (Stelazine), and chlorpromazine (Thorazine), can block insulin secretion and cause hyperglycemia. Many of the newer antipsychotic drugs also cause insulin resistance.
- Thyroid hormone, in elevated levels, raises the blood glucose by reducing insulin from the pancreas and increasing the breakdown of insulin.

Oral contraceptives were previously accused of causing hyperglycemia when the dose of estrogen was very high, but current preparations aren't a problem.

Many common medications, either on their own or by doing something to make the oral drugs that lower blood glucose more potent, also lower the blood glucose. The most important of these include the following:

- Salicylates and acetaminophen, known as aspirin and Tylenol, can lower the blood glucose, especially when given in large doses.
- Ethanol, in any form of alcohol, can lower the blood glucose, particularly when taken without food.
- Angiotensin-converting enzyme inhibitors, used for high blood pressure — such as quinapril (Accupril), captopril (Capoten), benazepril (Lotensin), fosinopril (Monopril), lisinopril (Zestril and Prinivil), and enalapril (Vasotec) — can lower the blood glucose, though the mechanism is unclear.
- Alpha-blockers, another group of antihypertensives that includes prazosin, lower the glucose as well.

- Fibric-acid derivatives like clofibrate (Atromid-S), used to treat disorders of fat, cause a lowering of blood glucose.
- Alcohol can also interact with medications and should be consumed in moderation and while being mindful of medical conditions and treatment.

WARNING

Interactions can occur between different drugs, but it is also possible for herbs and supplements to interfere with medications. For example, niacin (vitamin B3 and ginko extract) have been shown to affect pioglitazone. Some foods and alcohol can also interact with medications. Remember to check any supplements that you're taking with your pharmacist or doctor while using medications. You should thoroughly read the medical information leaflet for each drug.

TIP

If you start a new medication and suddenly find that your blood glucose is significantly higher or lower than usual, ask your doctor to check for the possibility that the new medication has a definite glucose-lowering or glucose-raising effect.

Considering Surgery

Doctors often differ in their opinions about using surgery to achieve weight loss and even put type 2 diabetes into remission, which is measured through a sustained reduction in HbA1C. It's a highly personal decision that you should carefully consider with your medical team and not one to make lightly. Bariatric or metabolic surgery for weight loss usually involves bypassing or reducing the size of the stomach resulting in feeling fuller sooner and eating less. The surgery also appears to make a difference to levels of hormones such as GLP-1, that affect insulin and also those which stimulate appetite. There's debate about whether calling surgery a "cure" for diabetes is appropriate, though long-term follow-up appears to provide excellent outcomes; one study published in the *Journal of the American Medical Association* in 2012 recorded a 62 percent diabetes remission rate six years after surgery. The patients in the study would all have been selected as appropriate for surgery, with ongoing specialist input after the procedure.

Weighing the pros and cons

A surgical approach isn't without risk and is generally advised only for people defined as obese who have a BMI greater than 30 with type 2 diabetes and are unable to achieve adequate control of their weight and diabetes with lifestyle changes and medications. If the risk of complications of diabetes is very high, and those complications aren't already at an advanced stage, then surgery may be considered on an individual basis.

There may be other benefits of weight loss surgery, including better blood pressure and lipid control, improvements in respiratory conditions associated with obesity, as well as psychological and sexual problems. People with type 2 diabetes who opt for surgery must fully understand the potential benefits and risks and also be willing to adopt healthy lifestyle habits, including regular exercise and a good diet to ensure the long-term success of surgery. There should be intensive follow-up, including regular reviews of medications, dietary and nutritional assessments, and support to monitor adequacy particularly of protein and mineral and vitamin intake. Post-surgical monitoring also needs to watch for any complications of the surgery.

Some people may need psychological help and connection with other people who have undergone surgery. Side effects of surgery can include anesthetic complications and postoperative infections as well as the more commonly experienced vomiting, loose stools, acid reflux, nutritional deficiencies, and tiredness that might be expected following a procedure on the stomach. As with all surgery, its safety and success largely depends on choosing the right surgery for the right person — and an experienced and reliable surgical team with a commitment to long-term support. Surgery isn't a substitute for lifestyle changes because even if your diabetes can be improved considerably, most chronic diseases of Western societies — whether related to diabetes or not — are highly influenced by diet and exercise.

The cost of surgery is a factor to be considered by healthcare providers. If the procedure is successful in achieving weight loss and improved diabetes control or remission, it can be expected that reduced costs of treating complications of diabetes may make it a sound investment.

Understanding and choosing metabolic surgery

Given the evidence that metabolic surgery, in good surgical hands, can be highly effective in weight loss, reducing medication burden, reducing HbA1C, and even resulting in sustained remission from diabetes as well as reduced rates of heart disease and death, there are many who call for it to be offered to a larger proportion of people with diabetes. The evidence cited includes the following:

- A study published in November 2014 in *Lancet Diabetes and Endocrinology* followed more than 2,100 obese adults who had metabolic surgery and the same number who didn't. After up to seven years, those individuals who had surgery were 80 percent less likely to develop diabetes than those who didn't.

- A meta-analysis published in the *British Medical Journal* in October 2013 concluded that metabolic surgery leads to greater body weight loss and higher remission rates compared to usual care. They noted both improvement in quality of life and reduction in medication use.

Some studies question the long-term sustainability of the effects of surgery. For example, a study in *Obesity Surgery* in January 2013 showed that 68 percent of type 2 diabetic patients who were either uncontrolled or medication-controlled went into remission by five years after gastric bypass (see the "Choosing the Operation" section, later in this chapter, for more information), but about 35 percent relapsed within five years of the initial remission. Those who relapsed were the patients with poor initial control, insulin use, and longer duration of diabetes. The authors agreed that the earlier the surgical intervention, the greater the durability of remission of the type 2 diabetes. The following are findings from some more recent studies:

- A review article published in 2019 (with *Current Diabetes Reports*) concluded that bariatric surgery induced remission of diabetes in 33 to 90 percent of individuals twelve months following the treatment compared with 0 to 39 percent of those patients who managed diabetes through medications. However, remission rates did decrease over time thereafter, though some advantage was maintained over individuals over medical therapy. It must be noted that remission rates vary considerably between studies and the patients selected for surgery are those who fit specific criteria including very high BMI.
- In 2020, a review article was published in the *Journal of the American Medical Association* supporting the conclusions that modern bariatric surgery has strong efficacy and safety in severe obesity and noted that the sleeve procedure is associated with fewer re-operations but gastric bypass surgery may deliver longer lasting weight loss and glycemic control.

As more evidence is gathered, it's certainly clear that surgery has a place as an option for people with obesity and type 2 diabetes, and it will probably be offered to a wider range of the population with diabetes.

The Different Operations Available: AGB, RYGB, and VSG

A number of operation choices are available. The following sections describe a few of the most common.

They're divided into restrictive operations and malabsorptive operations. The *restrictive operations* reduce the food you can eat but don't interfere with your

absorption of food. The *malabsorptive operations* interfere with the absorption of food by your intestines. All the operations are done *laparascopically*, which means the surgeon makes very small incisions in your abdomen and inserts long, slender operating instruments through these incisions.

As a result, you have much less postoperative discomfort and recover faster compared to an operation where your abdomen is opened. An even newer type of operation is single-incision laparoscopic surgery. The surgeon makes a single incision through the belly button, avoiding the four to five incisions of traditional laparoscopic surgery. There's a better cosmetic result, faster recovery, and less pain.

The three operations that we discuss in the following sections tend to be the most commonly performed at Bariatric Centers of Excellence. A number of other types of metabolic surgery have been developed, including biliopancreatic diversion with or without duodenal switch, vertical banded gastroplasty, and jejunoileal bypass. These other operations have been associated with short-term and long-term complications, particularly lack of absorption of key vitamins and minerals. However, if the more common operations aren't successful for one reason or another, these other operations may be considered as a next step.

Adjustable gastric banding (AGB)

The adjustable gastric banding (AGB) is a restrictive operation. An adjustable band is placed close to the top of your stomach, creating a small upper pouch and a much larger lower pouch. The normal stomach is about the size of a football. The small upper pouch is the size of a golf ball. The upper pouch can hold very little food. You get full quickly, and your feelings of hunger disappear when the pouch is full. In addition, a nerve called the *vagus* nerve runs along the stomach. The band squeezes the nerve when the pouch is full, sending a signal to your brain to stop eating.

The band is connected via a tube to an injection port under the skin. A salt solution inflates the band to the extent needed to promote sufficient weight loss.

Patients who have AGB tend to lose less weight than those who have a malabsorptive procedure. However, to lose weight, you must follow a strict diet.

Advantages of AGB include the following:

- It induces excess weight loss of 40 to 50 percent.
- It involves no cutting of the stomach or rerouting of the intestines.
- It requires a shorter hospital stay, usually less than 24 hours.

- It's reversible and adjustable.
- It has the lowest rate of postoperative complications.
- It has the lowest rate of vitamin and mineral deficiencies.

Here are the disadvantages:

- The patient experiences slower weight loss.
- More patients fail to lose 50 percent of excess weight.
- It leaves a foreign object in the body.
- It has the highest rate of reoperation.

Roux-en-Y gastric bypass (RYGB)

The Roux-en-Y gastric bypass (RYGB) is mostly a restrictive procedure but has some malabsorption associated with it. The stomach is stapled to create a small upper pouch totally closed off from the larger lower pouch. The upper pouch is attached to the small intestine so that the upper third of the intestine is bypassed, resulting in some malabsorption. The larger lower part of the stomach empties into the intestine, but no food can get to it so only digestive juices flow through it.

RYGB has these advantages:

- Long-term weight loss is significant, up to 60 percent.
- Favorable changes in intestinal hormones occur.

The disadvantages include

- It's the most complicated of the surgeries.
- It may result in long-term vitamin and mineral deficiencies.
- It has a longer hospital stay.

Vertical sleeve gastrectomy (VSG)

VSG is another restrictive operation. The stomach is divided so that the part left in the patient is a tube that isn't much wider than the intestine into which it empties, about 25 percent of the size of the original stomach. The operation results in

an early feeling of fullness similar to the AGB that we describe previously. The other part of the stomach is removed, and absorption isn't affected.

A study published in the *Journal of Visceral Surgery* in April 2013 compared the effects of AGB, RYGB, and VSG in terms of weight loss and postoperative complications and death with 26,558 operations evaluated. The conclusion was that VSG is midway between AGB and RYGB. The weight loss is less than RYGB but more than AGB. Complications and death are less than RYGB but more than AGB.

VSG may be best in the earlier stages of diabetes. Five years after VSG, only 10 percent of patients with more severe diabetes taking insulin were still in remission, whereas 59 percent of those taking oral antidiabetic drugs were in remission, and 81 percent of those who were about to develop diabetes but not yet on drugs hadn't developed the disease. This was the case even though the severe diabetics lost as much weight from the operation as the less severe cases.

Advantages of this surgery include

- There is rapid and significant weight loss.
- There is no foreign body or rerouting of the intestine.
- It has a brief hospital stay of two days.
- Favorable changes in intestinal hormones reduce hunger.

Some of the disadvantages are

- It's not reversible.
- Long-term vitamin deficiencies may occur.

REMEMBER

The longer an individual has type 2 diabetes, the more resistant they are to remission.

Preparing for surgery

Your surgeon will need to be an expert in their field and will prepare you for the surgery with all the information necessary. In the United States, you can find an accredited Bariatric Center of Excellence (COE). Bariatrics is the branch of medicine that treats obesity.

To become a COE-certified hospital, a hospital must go through a rigorous reporting process and inspection and perform a minimum of 140 bariatric surgical procedures each year. Two institutions do the inspections, collect data, and

accredit hospitals: The American Society of Metabolic Surgeons and the Surgical Review Corporation. To find a COE, check out www.surgicalreview.org/find-a-provider/.

COE must go through rigorous training, including the following courses and others:

- Obesity sensitivity training
- Proper moving of an obese patient
- Recognizing the signs and symptoms of bariatric surgery complications
- Post-op care of the bariatric patient
- Bariatric surgery post-op nutrition

Your surgical team will counsel you and ensure it's appropriate for you to undergo surgery and that you're fit to do so. Preoperative checks will be needed to check baseline blood tests, a chest X-ray, an electrocardiogram, and any other tests considered necessary. You'll be encouraged to become as fit as possible in the run up to the day of surgery to reduce your risk of complications and maximize the chances of success. Many surgeons will insist that you stop smoking and engage in an exercise plan before and after the operation. Nutritional advice will also be important, especially in the immediate aftermath of the surgery, to minimize the risk of complications.

Understanding short-term problems

Short-term complications can arise from any metabolic surgery and include the following:

- Internal bleeding that mostly stops spontaneously but occasionally requires reoperation
- Infection
- Blood clots in the legs that can travel to the heart and lungs
- Leaks after surgery, where tissue has been sewed together, which are suggested by a sustained rapid heart rate, rapid breathing, and fever
- Partial collapse of the lungs

Considering long-term problems

Certain long-term complications are common to all three types of metabolic operations. Complications that are common to all include

- Nausea or vomiting
- Excess or loose skin
- Small bowel obstruction with symptoms that include abdominal bloating, cramping, pain, nausea, and vomiting
- Stomach ulcers with pain, nausea, or vomiting and intolerance to foods

Each surgery also has its own long-term complications:

- With AGB, the band can slip or cause erosions. Although the average rate of band slippage is only 5 percent, if it slips, it can result in obstruction so no food can pass, resulting in nausea, vomiting, heartburn, and excessive weight loss.
- You may also experience leakage of the fluid in the band, causing the band to loosen so you have an initial feeling of fullness as the stomach is filled but rapid tolerance of more solid food and weight gain.
- You may also suffer from a nighttime cough after AGB.
- RYGB has complications peculiar to it. There can be closure of the opening through which food passes as a result of scar formation. Loss of tolerance to both solid and liquid food will follow. There can be an enlargement of the small opening between the two stomach parts so the patient tolerates more solid food and no longer loses weight. Also there's a condition called dumping syndrome when food and fluid pass into the small intestine too fast. Early symptoms include nausea, vomiting, stomach pain, diarrhea, and a feeling of fullness. Late symptoms due to low blood sugar include sweating, weakness or dizziness, nervousness, and the other symptoms of low blood sugar described in Chapter 4.

Other rare but possible complications can include instances of inadequate intake of key vitamins and minerals that can occur much later after surgery in months or years. You can experience a deficiency in any of the following, along with their expected symptoms:

- **Iron:** These symptoms due to anemia begin with feeling weak or tired and problems concentrating. Later the patient experiences brittle nails, pale skin, shortness of breath, and sore tongue. Iron deficiency is prevented by taking iron supplements as suggested by your doctor along with extra vitamin C, which promotes iron absorption.

- **Vitamin D and calcium:** Your doctor can discover this deficiency through a bone densitometry study, which may show bone loss. To avoid bone loss, take 2,000 international units of vitamin D daily plus 1,500 mg of calcium.
- **Vitamin B12:** This deficiency can cause symptoms of anemia similar to iron deficiency, but if present for a long time, you can get nerve damage, including confusion, dementia, depression, poor balance, and numbness and tingling of the hands and feet.
- **Folic acid:** This deficiency can cause fatigue, gray hair, ulcers in the mouth, and a swollen tongue.
- **Vitamin A:** This deficiency can cause loss of tearing of the eyes, loss of nocturnal vision, and decreased immunity.

TIP

Adhering to the recommendations of the COE is essential for your follow-up to surgery. Blood tests can detect them. With the exception of vitamin D and calcium, you can usually prevent vitamin deficiencies by taking two multivitamins daily.

Continuing diabetes treatment following surgery

During the immediate recovery period from your surgery and the months afterward, the treatment for your diabetes will certainly need to change. In particular, medications that risk side effects of hypoglycemia, such as short-acting insulins and sulfonylureas, will need to be reviewed and likely will be stopped. Because of the hormonal changes of surgery, this may also be true for GLP-1, GIP, and DPP-4 inhibitor drugs. Some medication doses may be reduced or ceased, though as regular measurement of your blood glucose informs you and your doctors of the effects of the surgery, some may be reintroduced later. It's important to follow the advice of the surgical team who should liaise with your physician. If you don't understand the management plan and how to make the necessary adjustments following the surgery, or if you receive unclear or conflicting advice, you must ask the doctors and their teams involved in your care.

IN THIS CHAPTER

- Discovering how to advocate for your own health
- Knowing what to expect from healthcare providers
- Recognizing the benefits of a multisystem approach
- Welcoming support in your diabetes care
- Checking out complementary therapies
- Making use of technology

Chapter 13
Assembling Your Diabetes Team

Creating a powerful, supportive, and proactive healthcare team is one of the best things you can do to improve your health and transform illness. Although medical doctors and allied healthcare professionals play a leading role in diagnosing diabetes, the more that a patient advocates for their own health, the better off they'll be. Your physician should be a partner on your wellness journey, and a team of qualified healthcare providers can assist both of you in achieving optimal wellness. This chapter explains who should be on your team and how to assemble that team.

Never has there been as much information at our fingertips about health and wellness as there is today. Our modern society offers many solutions for difficult times when mental and emotional health are compromised. Scores of mind, body, and spirit therapies can work simultaneously with conventional methods in medicine to heal the body using a multisystem approach. The internet is a goldmine of

information when used properly. Because it can also mislead and promote material that has the capacity to cause harm, this chapter outlines how to use technology properly to manage diabetes.

Advocating for Your Own Health

To heal and feel healthy, people with diabetes need to take responsibility for their own life journey. While it may seem daunting to some, this is actually a powerful step. Taking control of your health means that you're in charge and that you'll do what is necessary to make positive shifts in your overall well-being. No one else can feel your pain or know what your experience of "normal" is.

Even though doctors, coaches, and allied health practitioners are equipped with an education, certifications, and years of practice dealing with certain forms of illness, sometimes a situation may need a unique combination of modalities to help promote healing. It's best to keep journals, communicate openly with your doctor, and assume the role of a "professional" or "expert" patient, which means that you and your doctor partner to get you on track.

REMEMBER

Knowing as much about your condition as possible is so important, because it allows you to question and, where appropriate, to challenge your health practitioners to provide you with all the tools to help manage your health. Professionals who have their patients' best interests at heart will welcome and value such an approach and will want to work together to find the best outcomes. Physicians have a responsibility to ensure their patients have provided informed consent to treatment, and it's only through dialogue and understanding that this can truly be achieved.

If a symptom, or a combination of symptoms, is persistent and bothersome, let your doctor know. If the methods that they've prescribed aren't giving you the results you desire, you may be able to tap in to additional forms of assistance. Be sure to keep your doctor abreast of any new types of treatment you may receive and ensure that all your practitioners are appropriately trained and willing to work together and update one another. If they prefer you to communicate the information, organize yourself in a way that you can do it easily by having any relevant medical records (including your own observations) at hand and up to date with your providers.

You need to be the one who sees to it that the primary physician obtains a hemoglobin A1C (see Chapter 7) every three or four months and that you visit the eye doctor at least once a year. Your physician deals with many patients each day and can easily forget your specific needs, so you must let the doctor know what you

need and not expect them to read your mind. You may be dealing with other doctors who treat your heart, your lungs, and other parts of you. Each doctor needs to know all the medications you take.

Systems for accessing electronic medical records exist in many countries. At first, the idea of accessing medical records can be a little frightening, but after you realize the opportunities it provides, it soon becomes empowering and can help you discuss your goals with all those involved in your care. It's important to ensure you understand any narrative in the records; ask your doctors to explain any unfamiliar medical terminology so you know how to interpret results that may be uploaded to your records without explanation.

Taking charge of your healthcare is both an honor and a responsibility. Although you may wish that you weren't chosen for this particular role, you have it. You can make of it what you will. Take proper care of yourself, and creating the best team possible is the shortest, fastest route to good health.

Types of Healthcare Providers for Diabetes Support

In the United States, where you can find numerous specialists, only 8 percent of people with diabetes are regularly seen by a specialist. Because of the large size of the diabetic population and the requirements of a healthcare system with limited resources, the other 92 percent are in the hands of primary care physicians who have to deal with many other illnesses besides diabetes.

In addition to a primary physician, you may also work with a diabetes specialist, an eye doctor, a dietician, a podiatrist, a pharmacist, and a diabetes educator to fill your core medical needs. Supplemental care, such as mental and physical therapy, acupuncture, motivational coaches, friends, family, spiritual leaders, and counselors, can fill in the gaps and address underlying issues that create illness in the first place while helping you cope with the symptoms and side effects of having diabetes and treating it. In the following sections, we explain the role of each of these team members.

The primary physician

Research has demonstrated that diabetes care can be provided most effectively and efficiently where a strong primary healthcare system exists. Practitioners of primary care may be described as general practitioners, family physicians, or

internists, depending on the country in which they work. They provide long-term care close to the communities they serve, getting to know their patients and families; becoming the most trusted health professional; coordinating care; and maintaining an overview of all aspects of a person's health, some of which may relate directly or indirectly to diabetes.

The majority of patients with type 2 diabetes will be looked after without the need for referral to a diabetologist, unless the condition is difficult to control — for example, requiring insulin or where other complications exist. Groups of primary care physicians include one who has a particular interest in diabetes and who may have a team such as advanced care nurses who can run clinics under the physician's supervision.

TIP

Although using a primary physician instead of a specialist may not seem conducive to the best care, we can say many good things about it. Besides diabetes complications, you may have other things go wrong, and the primary physician can handle them as well. After all, if you had only mild heart disease, you may not require a cardiologist, and your primary physician could also manage your bronchitis very well. Having a doctor who knows you well and coordinates all your healthcare has real advantage.

You should expect your primary physician to have a decent working knowledge of diabetes. Chapter 7 describes the proper way to follow a person with diabetes. The various tests are essential to your health, and the primary physician must know which ones to order and when to send you to a specialist.

The endocrinologist

One type of specialist, an *endocrinologist,* should have the most in-depth knowledge of the management of diabetes. Endocrinologists have several years of advanced training (on top of the years of training in general internal medicine) and devote their practice to taking care of people with diabetes, plus patients with problems of the thyroid, adrenals, or other glands. A *diabetologist* is an endocrinologist who takes care of only diabetic patients.

If you have type 1 diabetes, you'll certainly see an endocrinologist. A new diagnosis of type 1 diabetes is a medical emergency and a specialist consultation shouldn't be delayed. You may be admitted to the hospital for stabilization, avoidance of immediate complications, and establishment of insulin treatment. The endocrinologist and their team will provide ongoing supervision and treatment. If you have type 2 diabetes and get into trouble with complications or control, you'll be sent to an endocrinologist for consultation. You can expect that this physician will be able to answer most questions that arise during the care of diabetes.

This doctor will be familiar with the newest treatments for diabetes, so if you have questions about the future of diabetes care, ask them. This doctor should also have the best understanding of all the drugs currently used for diabetes, how they interact with each other, their side effects, and other drugs that interact with them.

REMEMBER

If you're not satisfied with the answers you're getting from your primary physician, ask for a referral to a specialist to support you both in the best management of your diabetes.

If your endocrinologist or diabetologist makes any changes to your treatment, report those changes to your primary physician. One of the big problems in medicine is the lack of communication between medical-care providers of all types, not just doctors. It's a clear professional responsibility that medical notes are updated by correspondence between all those involved in your care. In some systems, electronic records are shared between professionals, which makes it much easier for specialists involved in your care to communicate.

TIP

For your own sake, make sure that all your medical-care providers know what the others are doing for you. Carry a list of your medications and show it each time you have a doctor visit. You may even want to carry the actual medications so the doctor can verify the medications and dosages. Alternatively, you may find it helpful to take a picture of your medication labels and refer to them on your mobile device. If your physician recommends a change to your medications, when you next order a prescription, take a few moments to carefully check that the record has been accurately updated. Remember that sometimes medication doses can be described in different units and sometimes different trade names for the same medication.

The eye doctor

The eye specialist (*ophthalmologist* or *optometrist*) ensures that your diabetes doesn't damage your vision. An ophthalmologist is a medical doctor who has specific training in disease of the eye and may specialize in diabetic eye treatment. An optometrist or ophthalmic optician undergoes different training but may be very well equipped and qualified to screen and monitor your eye condition, referring you to an ophthalmologist when further tests or treatment are considered appropriate. Your primary care physician will know the best system for specialist diabetic eye screening and care.

The eye specialist examines you for complications that can affect and, if left unchecked, impair vision. They must send a report to your primary physician and should also take the opportunity to educate you about diabetic eye disease.

The foot doctor

The foot specialist or *podiatrist,* is your best source of help with the minor (and some of the major) foot problems that all people suffer. You should go to them if you have such problems as toenails that are hard to cut, corns and calluses, and certainly any ulcer or infection of your foot. It's especially important to visit the podiatrist if you have any neuropathy. In that case, you're better off not trying to cut your toenails by yourself.

A specialist in foot care will be able to assess the nerve and blood supply to your feet that may be compromised by your diabetes. If they detect early signs of damage or a change to the condition of your feet, they may ask your primary physician to refer you to a neurologist or a surgeon who specializes in blood vessels (a *vascular surgeon*).

TIP

The foot specialist that we spoke with emphasized that the earlier you see a podiatrist, the less likely you are to have a minor problem turn into a major disaster. For example, an infected toe that would respond to soaking by the person without diabetes may need antibiotics, special shoes, and surgical removal of dead tissue in the person with diabetes.

The specialist can tell you which preparations you should not use on your skin. They can show you how important it is that you give lesions time to heal and not rush to put weight on your injured feet. Many podiatrists also give you a list of "do's and don'ts" for the proper care of your feet, such as conducting daily inspections and avoiding extreme heat.

The dietitian and other nutrition specialists

These professionals serve one of the most important roles in your care. Because most diabetes is type 2, and type 2 is greatly worsened by obesity, a good nutrition professional can really help you control your blood glucose both by eating the right foods and amounts and helping you to manage your weight. The dietitian can also show you which foods belong to which energy source — carbohydrate, protein, and fat. (See Chapter 8 for more on your diet.)

People with type 1 diabetes need to know how food interacts with mandatory insulin injections. The dietitian can teach you to count carbohydrates so you know how much insulin to take for your meals. A good dietitian shows you not only what you eat but how you eat as well. When do you consume most of your calories, and where do they come from? All food cultures and dietary traditions can be adjusted so you enjoy the foods you have always eaten while you stay within the bounds of a diabetic diet.

The science of nutrition is rapidly developing and it's very important that your dietician or nutritionist is up-to-date. They'll support you in conventional dietary advice and should guide you to ensure that you're equipped to recognize and avoid fad diets. There should be more emphasis these days on the foods that are healthful and good for diabetes rather than sticking solely to advice about macronutrients, suggesting reductions in fats, or encouraging calorie counting. Experts describe the Mediterranean style of eating as the best for diabetes (read more in Chapter 9), and this involves focusing on healthy ingredients (including whole grain carbohydrates) as well as the combining of ingredients that have a beneficial effect on glucose control. Your nutrition professional should understand and promote this type of enjoyable eating.

A nutrition professional can also show you what a portion of food really means. This demonstration is an eye-opener in most cases. Most people find that they've been eating portions much larger than necessary. Eating more slowly and focusing on the enjoyment of a meal in company is a sure way to eat smaller volumes without even noticing it. Evidence has shown that people eat larger quantities when they're watching TV.

Fortunately, when it comes to a diabetes-friendly diet, you can have your cake and eat it — but we're not talking about the high-sugar, artificially colored type of cake. One prepared with good ingredients such as oats, extra-virgin olive oil, dark chocolate, and a little natural honey with Greek yogurt can be a healthful occasional treat. But you can see in the appendix, which offers gourmet recipes for people with diabetes, that every culture makes delicious food that is actually good for the person with diabetes. For even more information on this important topic, see the latest edition of *Quick Diabetic Recipes For Dummies* (John Wiley & Sons, Inc.).

TIP

One thing you want to be sure of is that the dietitian is flexible in their approach to food. You may have to follow a few rules about where your calories come from, but you should have plenty of room for variation within those rules. The diet you're ultimately given should take into account your preferences as well as the fact that the amount of carbohydrate, protein, and fat is different for different individuals. Any dietitian who simply hands you a printed diet and says "Go follow it" is doing you no favor. A really good dietitian or nutritionist will also check for drug-nutrient interactions. Many medications increase your need for specific nutrients. On the other hand, there may also be nutrients that can block the effectiveness of a specific medication.

The diabetes educator

Every person on your team is an educator, but an actual diabetes educator is specially trained to teach you what you need to know about every aspect of diabetes so you properly take care of yourself. They should have *CDE* (Certified Diabetes

Educator) after their name. A CDE has taken extensive courses in diabetes and has passed an examination.

A diabetes educator teaches you how to take your insulin or pills, how to test your blood glucose, and how to acquire any of the other skills you need. You can find many diabetes educators in a diabetes education program. After you've gotten over the shock of having diabetes, asking your primary physician to refer you to such a program is a good idea. After you've gone through the program, go back and update yourself every few years. New drugs and new procedures are constantly being discovered. A diabetes educator can be a wonderful source of information about these advancements while making sure that you continue in your good diabetic habits.

TIP

Although individual education classes may be hard to find and be more expensive than group classes, studies suggest that individual education of people with diabetes may be more effective than group education. Group education can, however, provide peer support, a greater breadth of feedback to health professionals, and achieve significant success depending upon how it is organized and delivered.

The pharmacist

The role of a pharmacist may not sound important, but they're the link between your doctors and the medicine that you may need. A pharmacist is your guide to all the medications and tools required to control your blood glucose and manage any complications that you develop. They guide you into the use of all these strange and new products. You may see your pharmacist more often than you see any other member of your healthcare team.

Each time you start a new medication, a good pharmacist checks to make sure that it doesn't conflict with other medicines you're taking. The pharmacist tells you about side effects and makes sure that your doctor is checking you for adverse drug reactions or interactions. The pharmacist may give you a printout that tells you all you need to know about your new medication and that you can take home for reference.

TIP

Many pharmacists also prepare a list of medications that you take, telling you each drug's strengths and dosage frequency. You can carry this list around in case any doctor ever needs to know what you take.

TIP

Develop a relationship with your pharmacist. Modern pharmacists do a lot of educating. Posters in the pharmacy explain diseases and drugs. Pharmacists can tell you about helpful over-the-counter drugs that your doctor doesn't prescribe. They're also often aware of new drugs and treatments before they become well known. Some pharmacies have blood-pressure devices that you can use for free, as well as glucose meters.

Types of Counselors, Therapists, and Coaches Who Can Help

Diabetes certainly proves the fact that all diseases are both physical and emotional. Spikes in blood sugar, medicines, as well as medical symptoms from the illness itself can all cause fluctuations in mood and powerful emotions that many times get ignored because they may be embarrassing to discuss. Many diabetes patients who have never experienced mental therapy may take offense to a recommendation to seek mental health support.

FROM THE AUTHORS

From Amy Riolo: I know that when my primary care physician first recommended that I speak to someone about a serious illness, which I have now transformed, I was very upset. I felt like I had every valid reason to be physically ill, and it wasn't "in my head." My doctor at the time reassured me that anyone dealing with a challenging physical condition should have someone to talk to and recommended a mind-body therapist. That person helped me to propel my attitude and health from one of lack to abundance and played a major role in my healing. I would have never been able to heal myself if they were not a part of my team. As a result, I highly recommend finding the best type of mental/emotional therapy that can help you in this journey.

Your mental-health worker may be a psychiatrist, a psychologist, a mind-body therapist, or a social worker, or even your primary physician may play this role. In addition to helping on days when you feel you just can't cope, the person in this role may help you find meaning in life or uncover the root causes for your illness so you can overcome them. (See Chapter 1 for more about dealing with the emotional aspects of diabetes.) The mental-health worker supports you in a way that dealing with the body alone can't and can give you the tools to get you going again.

The Role of Your Family and Friends in Your Care

The people you live with, eat with, and spend time with play a key role on your team. Your family and friends can be a tremendous source of help, but you must clue them in to the fact that you have diabetes and, as a result, may have different dietary and lifestyle needs than before your diagnosis. If you have type 1 diabetes, you can teach them how to recognize when your glucose is too low, in case you're ever too ill to take care of yourself.

If you have type 2 diabetes, choose to enjoy healthful foods and communal meals, which will benefit everyone. Let them know that you don't want to be excluded from events that may have unhealthful foods but that you want to work together to create options that work for everyone. The appendix features recipes created by coauthor and chef Amy, who at age 15, began making recipes that adhered to her mother's diabetes guidelines while also pleasing the entire family. She believes that if she could do it as a teenager, so can anyone.

A family member or friend can also become your exercise partner; ask them to include exercise and physical activity into your social time. Sticking to an exercise routine is a lot easier when a partner is counting on you to show up to work out. Your family and friends can also accompany you when you visit the doctor and remind you to ask the doctor a question or to follow the instructions you received. Let these people know about your diabetes and buy them a copy of this book so they better understand what you're going through and how they can best help you.

Complementary Therapies for Diabetes Care

Traditional medical care isn't the only option for managing diabetes. Many additional complementary therapies may make a very real difference to how you feel. Through her work with the Maryland University of Integrative Health, coauthor Amy has learned the history and increasingly popular use of the following types of care that can be successfully combined with conventional healthcare to help patients achieve their health goals.

TIP

Some medical practitioners may be skeptical of so-called complementary therapies; however, an open-minded physician will support patients who find complementary therapies that help them manage symptoms and improve their sense of well-being. It can sometimes be difficult to measure the more subtle positive effects of hands-on therapy or of activities that involve relaxation and meditation, but if something is life enhancing, then there's no doubt that such practices can be of great benefit.

Some of coauthor Simon's medical colleagues raise objections to complementary therapies, suggesting that a lack of controlled trial evidence means that the effects are all placebo. But this skepticism often misses the point that not all human experience can be subjected to experiments and that the placebo effect can be a force for good. As the respected sociologist William Bruce Cameron said, "Not everything that counts can be counted and not everything that can be counted counts."

Doctors commit to an ethos of "first do no harm," and such should also be the mantra of practitioners of complementary therapies, many of which are rooted in tradition, are highly respected, involve prolonged periods of training, and are overseen by professional regulatory organizations. Sometimes these kinds of interventions are called "alternative" therapies; however, this implies that they replace conventional medicine. It's always important to explore different modalities of treatment alongside conventional medical strategies and in discussion with all the practitioners involved instead of seeing them as being exclusive or in opposition to one another.

Acupuncture

Acupuncture has a more than 2,500-year history, and in addition to its popularity in Asia, millions of Americans have received successful treatments. The World Health Organization recognizes acupuncture — which has been proven through controlled trials — to be an effective treatment of various diseases, symptoms, or conditions. Diabetes patients experience pain, headaches, depression, and hypertension, and acupuncture can help each one of these symptoms.

Acupuncture works by applying needles to painlessly stimulate the central nervous system. This, in turn, is believed to release chemicals into the muscles, spinal cord, and brain to stimulate the body's natural healing abilities and promote physical and emotional well-being. Many acupuncturists also use traditional Chinese herbal formulas as part of their work.

TIP

If you want to explore this route, ask your doctor for recommendations, view online reviews, and check the credentials of your practitioner before your session. The practitioner should offer a consultation where you can express your health goals and concerns and then, after examining you, give you a plan of treatment.

Herbal medicine

Herbal medicine is a traditional form of medicine that involves the study of pharmacognosy and the use of medicinal plants. Licensed (registered with the American Herbalists Guild in the US) clinical herbalists are able to prepare and administer herbal remedies for a variety of symptoms and ailments. We discuss particular herbs that have been studied for diabetes in Chapter 12.

We shouldn't be surprised that plant-based therapies can have beneficial effects. After all, many modern medicines originate from plants, and the anti-inflammatory effects of herbs, for example, have been well known for many years.

REMEMBER

Make sure that your herbalist is well aware of drug interactions and that you communicate with both your herbalist and your doctor, disclosing all types of medicines that you're taking.

Nowadays, an increasing number of healthcare professionals study herbal medicine to enhance their practice. These include but aren't limited to pharmacists nurses, health coaches, physician's assistants, medical doctors, osteopathic doctors, chiropractors, acupuncturists, physical therapists, yoga therapists, massage therapists, occupational therapists, fitness trainers, social workers, and health educators.

Yoga

Yoga has been advocated to help improve many bodily conditions, including regulating blood sugar, heart rate, and blood pressure; balancing hormones; promoting feelings of overall well-being; improving nerve function; building more muscle; and increasing flexibility.

For beginners, yoga videos and simple poses are a great place to start. Because exercise is an important part of healthcare for diabetes, you may want to consider finding a yoga therapist who can help you achieve your specific fitness and health goals. It's important to choose the type of yoga therapy that suits your lifestyle and activity level.

Chiropractic care

The chiropractic industry has boomed worldwide as a means to help patients deal with headaches and pain and provide significant relief from some of the most distressing symptoms of diabetes. Cases have been reported of patients with diabetic polyneuropathy who have symptoms from significant nerve damage caused by diabetes, who, after four months of chiropractic care, had much lower levels of both back pain and lower extremity discomfort.

Because type 2 diabetes is caused by lack of physical activity or increased weight gain, eating well and exercising are the starting point to better health. At times, however, diabetes patients have limited mobility. If their limitations stem from spinal misalignments, then removing them will increase overall health and wellness

Of course, as with other healthcare professionals, not all chiropractors are equal, and patients have different needs. If you think chiropractic care could be a good

option for you, ask your physician for a referral or search for a licensed practitioner with good reviews in your area. Your first appointment should include an analysis where the chiropractor suggests a plan of action. If they can't help you, they'll let you know that at the consultation. A good chiropractor will enable you to feel better after the appointment, and with each adjustment, help improve your bodily function.

Neuro-bio feedback

Biofeedback and EEG neurofeedback, also called *neurotherapy,* is an often missing link that can help patients' recovery from brain injuries, PTSD, anxiety, memory problems, and other symptoms. Biofeedback is the use of sensitive technological instruments to measure physical responses in the body and feed them back to you to help change your body's responses. You can observe the feedback on a computer screen or listen to sound feedback.

There are several types of neurofeedback, and by making an appointment with a practitioner, you can find out whether it's appropriate for your conditions. Many people with long-term health issues that have caused a change in the body's response benefit from EEG neurofeedback or brain-wave biofeedback. This is a form of biofeedback in which surface electrodes are placed on the scalp to measure specific brain-wave frequencies and provide feedback to the patient to help them improve balance, focus, relax, and increase flexibility of thinking.

Making Technology Work for You

Type 2 diabetes is a lifestyle disease. Some harmful choices for your lifestyle (which may have been unconscious) may have contributed to your development of type 2 diabetes. There should be no shame or guilt involved when discussing diabetes, however. It's now widely accepted that the causes of the majority of chronic diseases are rooted in the choices we make in the way we live our lives. The ways in which we think and behave are deeply connected with our physical health, and the communication between mind and body is crucial in unraveling a vicious circle of ill health and instead experiencing a virtuous circle of well-being.

Thankfully, once someone is diagnosed with a disease, such as diabetes, positive choices will help them control it. The internet and many health, wellness, and food and exercise-tracking apps can assist with the two key aspects of your lifestyle that affect diabetes: diet and exercise.

TIP

Because weight management is the main preoccupation of millions of people around the globe, numerous websites, services, and apps promise incredible results. Probably the single most important feature of a site, service, or app that will truly help you to succeed is continued feedback. If you get regular new advice (at least weekly) and peer support in the form of message boards where you can interact with others, you'll lose three times as much weight as with sites that provide only diet and exercise information on a noninteractive web page.

REMEMBER

A diet that promotes weight loss may well help people with type 2 diabetes, but only if it's healthy in all aspects of its recommendation. It's not advisable to adopt a diet that results in weight loss if it fails to provide good nutrition overall.

Glucose tracking apps

There has never been an easier time than the present to monitor glucose levels. While pricking to test the blood is still a valid option, there are newer alternatives on the market, which enable devices use CGM (Continuous Glucose Monitoring) systems. They're attached to the body to correspond with apps on smartphones to give easy and effortless readings anytime. We mention a few of the best options currently in use, but it's best to ask your healthcare provider for the latest options and which will work with your lifestyle. These apps are particularly valuable because they can help you see the effect on glucose levels of the foods you eat and the exercise you do.

Many of the newer methods require a prescription from a doctor. For example, there is one method called Freestyle Libre 2 that a patient must currently "qualify" for with their doctor before being written a prescription for it. Medtronic and Dexcom offer excellent glucose monitoring technology and real-time predictive alerts to your compatible phone without the need for scanning. Alerts can provide warnings of hypoglycemia to a compatible app, and this information can even be shared "in real time." Another company that offers glucose monitoring technology with nutritionist support is NutriSense. This combines the Freestyle Libre 2 system with "real-time analysis" that can show how individuals may respond differently to various foods. There is an algorithm to use this data to help individuals understand their unique response to foods and exercise. Chapter 7 discusses how to use the various glucose monitoring apps in detail. Talk to your doctor to determine which is best for you and the latest versions available.

REMEMBER

There are many apps on the market, but detailed reviews are beyond the scope of this book. If you choose to use an app to monitor your glucose or assist in your journey to optimal wellness, you need to read its terms and conditions and should discuss them with your physician. We don't, at the time of writing this book, collaborate with any of these apps or companies.

Technology integration (diabetes management) apps

Whereas some people like to use separate apps for the various aspects of managing diabetes, others prefer one concise location that will consolidate their data in one place. The following apps are currently available for Android and Apple devices:

- **One Drop for Diabetes Health app:** Choose your activities to stay healthy. You can pay extra for one-on-one coaching from certified health professionals. Automated alerts, community engagement, and regular health stat reports help you track your progress or adjust your actions if needed.
- **Diabetes:M:** A one-stop shop diabetes log app with test time reminders, a nutritional log and tracking system, integrations with fitness apps, and blood sugar trend mapping. The app allows you to track insulin stats based on the nutritional information you provide. Strategic tools include trend graphs and charts in adjustable timeframes, so glucose management is as seamless as possible.
- **My Sugr:** An app that does it all for type 1, type 2, and gestational diabetes management. It offers carb counting, glucose tracking, and bolus dose calculation estimates, and it can give you reports on your blood glucose levels over weeks, months, and years. It also estimates your hemoglobin A1C based on your tracking. The app has a user-friendly dashboard interface and the ability to sync with your glucose monitor. MySugr has unique features such as reminders that ping you to follow up with additional data when it may be easily forgotten, such as after workouts. All of its data and charts are easy to send to your doctor, so you can better achieve your goals.

Exercise apps

Some mobile apps can help you monitor your exercise goals on the go. The following user-friendly versions are tried-and-true and have stood the test of time. Of course, it's not uncommon for sites to change, so don't be afraid to do a bit of navigating and choose the sites and apps that work best for you and your lifestyle:

Here are some of the better websites with apps for exercise programs:

- **`www.freetrainers.com`** This site and app offer individualized fitness programs with advice and message boards for reading the experiences of others and offering your own. They have something for everyone from

beginning exercisers to established fitness devotees. You can even find a training partner at this site.

- **`https://workoutsforyou.com`:** At this site, you can get a personalized fitness program, weekly email tips, and unlimited email consultations. There are lots of member testimonials in case you want to read the experience of others. You have to pay for information and a program at this site.
- **`https://global-fitness.com`:** This website for Global Health and Fitness offers a large amount of information on fitness with lots of feedback from trainers. It touts itself as the first weight-loss and fitness program on the internet, starting in 1996. It's another site where you pay for information and training.
- **MapMyWalk app:** This app offers workout routines, including yoga, core strength, get fit fast, total body workouts, and more. It also lets you clock your own walks, their distance, and the number of calories burned. The social media format allows you to share (if you choose) your workouts to get comments and virtual high-fives from other members. The app allows you to create a library of exercise routines to have on hand as well.

TIP

None of these sites tell you about the people who didn't do so well or even the ratio of successful to unsuccessful clients. Don't spend a lot of money upfront until you're sure the program is what you need and what works for you.

Sites for eating and groceries

There has never been more readily available assistance for those looking to eat and purchase ingredients that promote diabetes-friendly eating. We have put together a list of beneficial online resources that can be accessed anywhere at any time. Following are some of the better sites for diet and weight loss:

- **`www.diabetesfoodhub.org`:** This free, comprehensive diabetes-focused site gives you a choice of many different, mouthwatering recipes, meal planners, and grocery list templates. It includes several diet categories, including Lower Carb, Budget-Friendly, Breakfast, Mediterranean, Snacks, and more. Several of the recipes are from coauthor and chef Amy's previous books. Be sure to take advantage of all the free resources on this site, including the Healthy Eating Blog.

REMEMBER

Keep in mind that fitness and engaging in pleasurable activities is an important component of successful "diets."

- **`https://diet.webmd.com`:** This free site uses a questionnaire to develop a "diet just for you." The diet, which is called a nutritional plan, is personalized and nutritionally sound. You fill out a daily nutritional journal that the people at WebMD comment on. They analyze your progress and nutritional needs each week. WebMD is filled with useful information for people who must lose weight for any reason. It also emphasizes fitness, as any good diet program should.

REMEMBER

Not everything you find on the internet is true, let alone reputable. You can find reliable information on websites of organizations such as the American Diabetes Association, the UK's National Health Service website, and other charities and foundations. Health on the Net Foundation has established a set of principles that any site can adhere to. From its website at `www.hon.ch` you can search for medical sites that follow the HONcode principles.

4 Special Considerations for Living with Diabetes

IN THIS PART . . .

Know how to help your child manage their diabetes and avoid possible problems.

Regulate diabetes in the elderly and handle any challenges before they become more serious.

Identify any potential occupational and insurance problems so you can overcome them.

Be up-to-date on what's new in diabetes and work closely with your doctor on cutting-edge treatments and care.

IN THIS CHAPTER

- Managing diabetes from infancy through young adulthood
- Dealing with obesity and type 2 diabetes in children
- Taking care of your sick child
- Checking out how team care can help

Chapter 14
Managing Diabetes in Children

Until a few years ago, almost all diabetes in children was type 1 diabetes. Since then, a vast change has taken place. The incidence of type 2 diabetes is rapidly approaching the incidence of type 1 diabetes in children, and the culprits to blame for this huge increase are the food they eat, obesity, and lack of exercise.

Children with diabetes present special problems that adults with diabetes don't have. Not only are they growing and developing from babies to adults, but also they have problems of psychological and social adjustment. Diabetes can add complications to a period of time that often isn't exactly smooth, even without a diagnosis of diabetes.

Many doctors believe that if a child has diabetes, the situation is as if the whole family really has the disease because everyone must adjust to it. And because diabetes is the second-most common chronic disease in children after asthma, it's no small problem.

In this chapter, you find out how to manage diabetes in children at each stage of growth and development. You need to remember that your child is first a child and then a child with diabetes. And you also need to remember that no one is to blame for your child's diabetes. Although diabetes is a serious problem, it's nothing you and your child can't handle.

Dealing with Diabetes in Your Baby or Preschooler

If your infant or preschooler is diagnosed with diabetes, you may feel overwhelmed. The information in this section can help you understand that this diagnosis isn't the end of the world — it's the beginning of many years of special care for your child.

Nurturing a diabetic infant

Type 2 diabetes is almost never seen in babies. The current epidemic of type 2 diabetes in children is the result of excessive weight gain, which is rare in babies and toddlers. The treatments described in this section are for type 1 diabetes.

Although type 1 diabetes doesn't usually show up in babies, it can, and you should know what to expect when it does. Obviously, at this age, your baby isn't verbal and can't tell you what is bothering them, and it may be difficult to detect the fact that they're urinating excessively in their diaper. The baby will lose weight and have vomiting and diarrhea, but these symptoms may be ascribed to a stomach disorder rather than diabetes. When the diagnosis is finally made, the baby may be very sick and require a stay in a pediatric intensive care unit. Don't blame yourself for not realizing that your baby was sick with diabetes.

After the diagnosis of type 1 diabetes is made, the hard work begins. You must learn to give insulin injections and to test the blood glucose in a child who will be reluctant to have either one done. You have to learn when and what to feed the baby, both to encourage growth and development and to prevent low blood glucose.

At this stage, you don't need to be as worried about tight glucose control as you will be later on. There are several reasons why not. First, the baby's developing neurological system can be damaged by frequent, severe low blood glucose, so the glucose is permitted to be higher now than later on. Second, studies show that changes associated with high blood glucose leading to diabetic complications don't begin to add up until the prepubertal years, so you have a grace period during which you can allow less tight control.

TIP

According to a study in *Diabetes Care* in June 2011, vitamin D deficiency is associated with increased prevalence of diabetic eye disease in children and adolescents. Make sure your child has sufficient vitamin D. It's available as drops that you can add to your baby's food.

On the other hand, small babies are very fragile. They have less of everything, so small losses of water, sodium, potassium, and other substances lead more rapidly to a very sick baby. If you keep the baby's blood glucose around 150 to 200 mg/dl (8.3 to 11.1 mmol/L), you are doing very well.

Taking care of a toddler with diabetes

Diagnosing diabetes in your preschooler may be just as difficult as it is in the baby. The child may still be preverbal and wearing diapers.

A preschooler is beginning the process of separating from their parents and starting to learn to control the environment (by becoming toilet-trained, for example). This separation process makes it more difficult for you, the parent, to give insulin injections and test the glucose. You must be firm in insisting that these things be done. You'll need to do them yourself because a small child neither knows how to do them nor understands what to do with the information generated by the glucose meter.

Because a toddler's eating habits may not be very regular, the use of very short-acting insulin like lispro is especially helpful. Painless real-time monitoring of blood sugars, which involves sensors rather than relying on blood samples, are likely to be particularly useful for younger age groups. As the technology advances, licenses are being sought by manufacturers for use of their systems in children as young as two years.

Becoming an educated caregiver

TIP

For a time of variable duration in the child with type 1 diabetes — a so-called "honeymoon period" — your child will have seemingly regained the ability to control their blood glucose with little or no insulin. This period always ends, and it isn't your fault that it does. When it ends, you have to work with your child's doctor, dietitian, and diabetes educator to find out how to control diabetes with insulin.

To give your child appropriate care, you need to know how to do the following things:

- Identify the signs and symptoms of hyperglycemia, hypoglycemia, and diabetic ketoacidosis (see Chapters 4 and 5). Each child has a particular way of expressing low or high blood glucose, for example, by becoming quiet or loud. Learn the signs for your child, and notify anyone else who cares for them.
- Administer insulin (see Chapter 11). Thanks to rapid-acting insulin, you can wait to see how much the baby is eating before you decide on the amount of insulin.

- Measure the blood glucose and urine ketones (see Chapter 7). Very frequent blood glucose measurements are essential. The more information you have, the better the control and the less frequent the hypoglycemia. Most children need between four and seven blood glucose measurements a day to achieve excellent control.

TIP

Toddlers who are toilet-trained may have accidents when their glucose is high, because high glucose causes a large quantity of urine.

- Treat hypoglycemia with food or glucagon (see Chapter 4). Young children require half of the adult dose of glucagon. Glucagon may cause a toddler to vomit, but it still raises the blood glucose.
- Feed your diabetic child (see Chapter 8).
- Set an example for lifelong exercise for your child by exercising with them.
- Know what to do when your child is sick with another childhood illness. If your child must go to the hospital, approach it as a positive experience — a chance to get a tune-up.

Your responsibilities as the parent of a diabetic baby or preschooler are extensive and time-consuming. Training your usual helpers to take over, even for a short time, is especially difficult. Unless you hire a professional to take over for a while, you may not get very much time away from your diabetic infant.

Placing your child in preschool is a difficult decision. You can do so only if you're sure that the adult supervisors are fully aware of your child's needs and willing to provide for them.

TIP

Your other children may resent the attention that you pay to this one child. If your other children start to misbehave, this may be the reason.

Helping Your Primary-School Child With Diabetes

Around age 10, some children are found to have type 2 diabetes. Important differences exist in the way type 1 and type 2 are recognized and treated. Therefore, we discuss each type separately in this section. Until the new millennium, only 3 percent of cases of diabetes in adolescents were due to type 2 diabetes. At the time of this writing, 45 percent of new cases of diabetes in adolescents are due to type 2 diabetes, and this proportion is rising, especially in ethnic groups noted to be at particular risk. However, that ratio is changing with a rapid increase in type 2 diabetes, though

the exact proportion and numbers vary in different regions of the world. For a discussion of why that number has grown so rapidly, see the section "Preventing and Treating Obesity and Type 2 Diabetes in Children," later in this chapter.

In 2020, the Center for Disease Control and Prevention in the United States reported that the rate of new cases of diabetes in people younger than 20 years increased significantly between 2002 and 2015, with a 4.8 percent increase per year for type 2 diabetes and a 1.9 percent increase in type 1 diabetes. Although an increase in obesity in younger people is thought to be the main driver of the jump in rates of type 2 diabetes, the reasons for the rise in numbers of those with type 1 diabetes is less clear.

Coping with type 1 diabetes

In some ways, type 1 diabetes care gets a little easier with a primary-school child, but in other ways, it gets more difficult. Your child can finally tell you when they have symptoms of hypoglycemia, so that part is easier to recognize and treat. On the other hand, you must begin to control the blood glucose more carefully because your child is reaching the stage where optimum control really counts in the long term.

You still have a child who is growing and developing, so nutrition remains critical. You must provide enough of the right kinds of calories to fuel the growth process. A snack such as 4 ounces of apple juice and a cracker or biscuit between breakfast and lunch, between lunch and dinner, and at bedtime can help smooth out glucose control and avoid hypoglycemia.

With age, your child is going to do more to separate from you. They may insist on giving insulin shots and doing blood tests. Studies indicate that primary-school years aren't a good time for you to give up these tasks, certainly not completely. Your child may not be physically capable of performing them and, in an attempt to hide the disease from peers, may not perform them at all during school. Diet may also suffer at school as the child tries to fit in and not stand out by eating the things that diabetes requires.

Managing hypoglycemia

TIP

Because you're beginning to tighten the level of glucose control, hypoglycemia is more of a risk, especially at night. At this stage (and from now on), you can avoid hypoglycemia by taking any or all of the following steps:

- Regularly provide a bedtime snack that includes some healthy carbohydrates, whole-milk plain Greek yogurt, fats and proteins such as almond or peanut butter with a cracker, raw vegetable with hummus, or a good-quality cereal with yogurt. See the appendix for more snack ideas.

- Measure and treat low blood glucose before bedtime.
- Occasionally check the blood glucose at 3 a.m.
- Ask your child about symptoms of nighttime low blood glucose, such as nightmares and headaches.
- Be sure your child doesn't skip meals.
- Have your child eat carbohydrates before exercising.

REMEMBER

At least one member of your family must be able to administer glucagon by injection to treat hypoglycemia should you be unable to get your child to eat or drink.

Handling school issues

When your child goes to school or a daycare setting, you need to address new problems. One issue is that they interact with other children, want their approval, and want to fit in. Your child may consider diabetes a stigma and be very reluctant to share that they have it. A plan of treatment that interferes with school and friendships may be very unwelcome.

Other issues may arise regarding the school's willingness to participate in your child's care. To best handle these issues, you must be aware of your rights.

Federal laws in the United States, especially the Diabetes Education Act of 1991, specify that diabetes is a disability and that it's unlawful to discriminate against children with diabetes. If a school receives federal funding or is open to the public, it has to reasonably accommodate the special needs of the diabetic child. There are often equivalent laws in other countries.

TIP

In the United States, any school receiving federal funds must develop a *Section 504 plan* to meet the needs of the disabled child. This plan refers to Section 504 of the Rehabilitation Act of 1973, and it takes every need of the child into account from the moment they're picked up in the morning by a bus driver (who must know how to help the child with a diabetic problem) until they arrive back home at the end of the day. The plan includes the child's self-care abilities, and it lists trained personnel by name and responsibility.

TIP

If you plan to send your child to a private school that receives no federal funds, before enrolling, insist on a plan of care for your child identical to a 504 plan.

The law requires that a diabetic child be able to participate fully in all school and after-school activities. Therefore, provisions must be made for blood glucose testing, for treatment with insulin, and for taking snacks or going to the bathroom as needed.

The written Section 504 treatment plan is developed by your doctor, you, and the school nurse, and relevant people in the school have assigned roles. The plan must include

- Blood glucose monitoring
- Insulin administration
- Meals and snacks
- Recognition and treatment of hypoglycemia
- Recognition and treatment of hyperglycemia
- Testing of urine ketones as indicated

As the parent, you're responsible for providing all supplies for testing and treatment. The school provider has a responsibility to understand and treat hypoglycemia, to test the blood glucose and treat it when the level is outside certain parameters, to coordinate meals and snacks, and to permit excused appointments to the doctor as well as restroom use. There is no reason that your child should not participate fully in school.

REMEMBER

You have to provide a kit every day for school that contains everything the child needs to test the blood glucose and, if necessary, the urine for ketones. The kit must also include any necessary insulin and syringes. A list of signs and symptoms of high and low blood glucose is another useful addition to this kit. A source of food must be available to the child throughout the school day, both for snacks and prevention of hypoglycemia during exercise. The teachers need to know to remind the child to eat. The child must be free to eat when necessary and not have to request food from the teacher.

These kits and food sources also have to go with the child whenever the child leaves school — for example, for a fire drill or a field trip.

Recognizing and treating type 2 diabetes

A number of clues point to a child having type 2 diabetes rather than type 1:

- The child is overweight rather than underweight at diagnosis.
- Symptoms, such as thirst and increased urination, are mild or not present at all; if they're present, they have been going on for a long time (often months).
- The child has a strong family history of type 2 diabetes.
- The child's glucose level at diagnosis is usually lower than the glucose of a patient with type 1.

- The child belongs to an ethnic group at increased risk for type 2 in a contemporary American, European, and Australian environment, such as African American, Latino, Asian, or Native American.
- The child has *acanthosis nigricans* — dark or thickened patches on the skin between the fingers and toes, on the back of the neck, and on the underarms. These patches are present in 90 percent of type 2 patients. For more information, read "Everything You Need to Know About Acanthosis Nigricans" at `www.healthline.com/health/acanthosis-nigricans`.
- An older girl may have irregular menses caused by polycystic ovarian syndrome (see Chapter 6).

Despite these clues pointing to type 2, the two types of diabetes can be confused for several reasons. Type 1 diabetic children may be overweight. Type 2 children may have ketones in their urine, just as type 1 patients do. The glucose level at diagnosis in some type 1 children isn't very elevated. And the overall occurrence of type 2 is still low enough that the doctor may not think of the possibility.

Some children actually have "double diabetes." These children have type 1 diabetes but were overweight or obese at the time the diagnosis was made. In these children, lifestyle modification plays an important role in the treatment. Weight loss and exercise will help bring the glucose under control, even though insulin is the primary treatment.

An important thing to remember is that type 2 diabetes responds to treatment with insulin much more rapidly than type 1, and the child may not need insulin at all after a proper diet and exercise are established. No child with type 1 diabetes can live without insulin.

TIP

If you have an overweight child — one who is more than 120 percent of their ideal weight for height — you should request that your doctor screen them for diabetes every two years by using a fasting blood glucose test.

REMEMBER

The treatment of type 2 diabetes, both in children and adults, starts with lifestyle change. You, the parent, must make the commitment to exercise with your child every day. You should meet with a dietitian or nutritionist to discuss a diet for the whole family that provides sufficient nutrition for the growing child while allowing for weight loss. If these two things are accomplished, no more steps will be necessary. That means limiting TV and screen time so the child is active rather than passive. You may consider getting a pedometer for your child and encouraging them to build up the number of steps taken each day, with prizes for reaching goals. As we've stressed throughout this book, it's important not to shame your child, to encourage positive and enjoyable change, and to share with your child a healthy relationship with weight and body image, encouraging self-care and self-esteem.

SHIFTING RESPONSIBILITY TO THE CHILD

As your child grows and matures, you'll constantly be concerned with the question of when to let them take over. Tim Wysocki, PhD, looked at 648 children to see when they were able to take over key skills. He found that 50 percent of children had mastered the following tasks at the younger age in the ranges below, whereas 75 percent had mastered the tasks at the older age. You can use the following results as a general guide for your child:

- Pricking finger with lancet: 5–6
- Performing blood glucose test with a meter: 6–7
- Stating symptoms of high blood glucose: 7–9
- Giving injections to self: 8–10
- Drawing up mixture of two types of insulin: 10–11
- Stating reasons for need to change insulin dose: 8–12
- Testing urine for ketones: 8–14
- Adjusting food intake according to blood glucose: 9–14
- Adjusting insulin dose according to blood glucose: 13–18

If diet and exercise don't return the blood glucose to normal, oral hypoglycemic agents (see Chapter 11) are used. Currently, metformin is the only oral drug approved by the FDA for children. If oral agents fail, insulin is given.

Managing Your Adolescent's Diabetes

If an adolescent or young adult has type 2 diabetes, the information in the previous section applies because the goal remains the same no matter what the age: Improve diet, normalize weight, and increase exercise to achieve normal blood glucose levels. Therefore, we focus our attention in this section and the next on type 1 diabetes roughly corresponding to the teenage years.

Your adolescent or teenager with type 1 diabetes will provide some of your biggest challenges. This is the time period when most childhood diabetes begins. The Diabetes Control and Complications Trial showed that tight glucose control can be accomplished beginning at age 13 and that this control can prevent complications. The higher frequency of severe hypoglycemia that accompanies tighter control, though undesirable and potentially dangerous, wasn't found to be damaging to the brain of a child at this age. However, children at this age don't think in terms of long-term

blood glucose control and prevention of complications. So they may be less willing to do many of the tasks required to control their diabetes on a regular basis.

TIP

The goal of treatment at this stage is a hemoglobin A1C between 7 and 9 percent (see Chapter 7). A value above 11 percent indicates poor control. (This isn't true for smaller children, who are allowed to have a higher hemoglobin A1C.)

TIP

The outlook for children with type 1 diabetes has improved dramatically in the last few years. Before 2000, their life expectancy was 19 years less than the general population. Between 2000 and 2011, life expectancy increased to just four years less than the general population, and improvements in care continue.

This stage is when your child is most eager to become independent. You don't want to give up all control at this time for several reasons:

- Your child actually does better if they have limits that are clearly stated, negotiated, and adhered to.
- The "shame" of diabetes may cause the child to skip shots and food, especially around friends.
- The problem of eating disorders (see Chapter 8) may pop up at this time, especially among girls trying to maintain a slim body image. Girls with diabetes know that if they skip their injections, they lose weight. They may ignore the high blood glucose that results.
- Teenagers with diabetes may still be unable to translate levels of blood glucose into appropriate action.

The hormonal changes that occur in puberty are often associated with insulin resistance. These physical changes may be a source of loss of control rather than any failure of your child to follow the diabetic treatment plan.

Upward adjustment of the insulin may overcome this problem.

TIP

Strenuous exercise may play an even greater role in the life of your child at this age, and type 1 diabetes is no reason to prohibit exercise. The result will be a significant reduction in the amount of insulin required after exercise.

The blood glucose measurements will help you to define your child's need for insulin. If your child plays a team sport, the coach and teammates must be aware of the diabetes and permit your child to eat, go to the bathroom, and take insulin as required.

Make sure that your child snacks regularly; keep healthy snacks readily available no matter where your child may be.

Handing Over the Reins to Your Young Adult Child with Diabetes

When your child becomes a young adult, you definitely want to give up the control that has helped them thrive up to this point. Your child should be doing their own testing. They're ready to leave the pediatric level and begin to work with doctors who care for adults, so you'll probably be out of the loop. Your child should now have the skill to choose appropriate insulin treatment based on blood glucose levels and diet.

Your child now has new challenges, including finding work, going to college, finding a future partner, and finding a place to live independently. At the same time, the reluctance to admit to diabetes and the desire for a thin body may continue to complicate care.

Diabetes care must be intensive at this point (see Chapter 11). Multiple shots of intermediate and short-acting insulin are taken. Your child must follow a diabetic diet (see Chapter 8), and an exercise program is essential (see Chapter 10). The rest of this book really has to do with the tasks that your young adult child with diabetes faces.

OFF TO COLLEGE

When your child leaves for college, they have all the responsibility for the diabetes. Your job is simply to make sure that all the equipment for testing the blood glucose and administering insulin is available to them. You should also make the college aware of your child's medical condition. Encourage your child to find one or more people at the college, such as a roommate or sports teammate, who are prepared to help when necessary.

Two issues are particularly important to discuss before the student leaves for school: alcohol use and sexual activity. Alcohol use may significantly increase in college, which means that your child may consume many empty calories and run the risk of severe hypoglycemia if they fail to eat properly. If you have a diabetic daughter, discuss with her the risk of pregnancy when diabetes isn't in control. (See Chapter 6 for information.) Young adults of both sexes should know how to prevent sexually transmitted diseases.

College, like the rest of your child's life, can be experienced just as it would be if diabetes were not present. The key is planning.

Preventing and Treating Obesity and Type 2 Diabetes in Children

The epidemic of obesity, which has spread to children in the United States in the past few decades, has led to a much higher prevalence of type 2 diabetes in children than was ever seen before. As many as one-third of all U.S. children are overweight or obese. However, only a fraction of these children go on to develop diabetes.

A number of medical conditions can cause obesity in children, but they represent probably 1 percent of the causes. Most of them can be diagnosed during the course of a good physical examination by your child's doctor. By far, the major reason for obesity in children is down to diet and lifestyle factors.

Even without diabetes, obesity is a burden for children because the child faces severe psychological and social consequences:

- Increased risk of being teased by peers
- Less comfortable family interactions
- Poor body image
- Low self-esteem

Defining obesity in children

Obesity isn't just responsible for type 2 diabetes. It can also provoke a number of other dangerous medical conditions in children. These include

- Metabolic syndrome, discussed in Chapter 5, leading to an increased tendency for heart attacks and strokes
- Polycystic ovarian syndrome, discussed in Chapter 6, leading to infertility, abnormal menstrual periods, and hairiness in girls
- Heart disease due to the increased work of the heart
- High blood pressure, which can damage the heart and the kidneys
- Sleep disorders like obstructive sleep apnea with snoring and increased blood pressure
- Fatty liver with abnormal liver enzymes in the blood
- Gallbladder disease

- Bone and joint diseases due to the weight on the bones
- Skin abnormalities like acanthosis nigricans, black velvety patches on the joints and under the arms
- Nervous-system diseases such as increased pressure in the brain with headache and visual disturbances

Preventing obesity in children

Prevention of obesity is much preferred over treating the damage that it does. You can do the following things to prevent obesity in your child:

- Try to have a normal weight before you become pregnant.
- Exercise throughout your pregnancy.
- Breastfeed for at least six months if possible. A study in *Diabetes Care* in March 2011 showed that it reduces the occurrence of obesity in your child and reduces the increased obesity in your child associated with exposure to your diabetes while in the uterus. A systematic review of the studies published in *Current Diabetes Reports* in 2019 confirmed the convincing evidence that breastfeeding offers significant protection from developing type 2 diabetes.
- Eat meals together as a family.
- Avoid sugary drinks and fatty poor-quality foods as discussed in previous chapters. Instead, enjoy a more healthy diet.
- Restrict time for sedentary activities like TV or computers. Adolescent boys with screen time of two hours or more daily have twice the risk of insulin resistance compared to boys with less than two hours.
- Encourage enjoyment of exercise daily and do it with your child.

TIP

The outlook for children with type 2 diabetes is much worse than type 1 diabetes with much earlier death due to heart disease, on average just 27 years after the diagnosis is made. The incidence of high blood pressure and kidney disease, including kidney failure, also rises rapidly. There needs to be much more focus on prevention and better treatment.

Dealing with type 2 diabetes

Adding type 2 diabetes to obesity can be devastating. The consequences of the preceding problems may lead to failure to manage the diabetes because the child wants to avoid any activity that makes them even more different from their peers.

REMEMBER

You must help your child to lose weight because obesity in children usually continues into adulthood. With the assistance of a dietitian, you can figure out the food that your child can eat to maintain growth and development without gaining more weight. One of the most helpful techniques is to take the child into the supermarket and point out the difference between empty calories and nourishing calories. Another is never to make high-calorie and unhealthy food, such as cake and candy, a reward. Finally, if you keep problem foods out of the house, there is much less likelihood that your child will eat them.

When type 2 diabetes develops, treatment should begin as early as possible to minimize the development of complications. Depending on the severity of the diabetes, the treatment can utilize any or all of the following approaches:

- **Lifestyle changes:** Parents must set an example of good dietary and exercise habits. Some studies suggest that if parents go first, children will follow. The best diet is one that emphasizes a variety of vegetables, some fruits, and small amounts of protein with minimal processed carbohydrates like candy and pastries. The best exercise is any activity you will continue to do regularly.
- **Drugs:** Until recently, the only medications licensed for use under the age of 16 were metformin and insulin, and this remains the case in Europe, though this is constantly under review. In 2019, the injectable medication liraglutide was licensed for use in children in the United States, followed by a similar drug exenatide in 2021. Use of these medications is under regular review to monitor safety in the long term. It's likely that more medicines are licensed for use in children in the next few years.
- **Surgery:** As a last resort, bariatric surgery can be considered, with adjustable gastric banding currently the preferred surgical option because it's reversible. Surgery at any age isn't something to be considered lightly and, like any medical intervention, does have some risks and potential for complication.

TIP

The International Pediatric Endosurgery Group has published bariatric surgery recommendations for children and adolescents. Essentially, the recommendations exclude children who haven't attained final or near-final adult height. The BMI must be greater than 40 kg/m2 or greater than 35 kg/m2 if other diseases such as diabetes or heart disease are present. A trial of lifestyle change has been unsuccessful. The family unit should have a psychological evaluation and be stable. The surgeon should be experienced and have a team that can do long-term follow-up. The adolescent will adhere to healthy dietary and exercise habits after surgery.

WARNING

Surgery in preadolescents or in people planning to become pregnant within two years isn't recommended.

Taking Special Care of Sick Children

The comments in this section apply primarily to a child with type 1 diabetes because children with type 2 diabetes do not lose diabetic control to nearly the same extent.

Any child is susceptible to all the usual childhood illnesses, but diabetes complicates your child's care during these times. An illness can affect diabetes in opposite ways. An infection may increase the level of insulin resistance so that the usual dose of insulin isn't adequate. Or it may cause nausea and vomiting so that no food or drink can stay down, and the insulin may cause hypoglycemia. For this reason, you need to measure the blood glucose in your sick child every two to four hours. Continuous glucose monitoring systems offer the possibility of even more regular measurements. If the glucose is more than 250 mg/dl (13.9 mmol/l), you need to give extra short-acting insulin (see Chapter 11). If it's under 250, you give more carbohydrate-containing nutrients.

You also need to test ketones in your child's urine or blood once or twice a day (see Chapter 7) while they're sick, especially if the glucose is over 300 mg/dl. If the ketones become elevated, you need to discuss the situation with your doctor.

You should probably feed your child with clear liquids like tea and soda during the sick days. Don't offer your child milk because it upsets the stomach. As long as your child can hold down clear liquids, you can continue to take care of them. If your child can't hold down clear liquids, you must contact your doctor and bring your child to the hospital.

While the blood glucose remains higher than 250 mg/dl, use tea, water, and diet soda so as not to add calories of carbohydrate. When the blood glucose is less than 250 mg/dl, you can use regular soda or glucose drinks.

Checking for Thyroid and Celiac Diseases in Type 1 Children

Because type 1 diabetes is an autoimmune disease (see Chapter 2), it isn't surprising that children with type 1 have other autoimmune diseases more commonly than unaffected children. The disease that is found most commonly in association with type 1 diabetes is autoimmune thyroiditis. This condition is discovered by obtaining a blood test that shows an abnormal increase in proteins in the blood called thyroid autoantibodies. In a study of 58 patients with type 1 diabetes (*Diabetes Care*, April 2003), 19 were found to have autoimmune thyroiditis.

Autoimmune thyroiditis usually results in no symptoms, but occasionally it causes low thyroid function *(hypothyroidism)*, and even more rarely it causes high thyroid function *(hyperthyroidism)*. Autoimmune thyroiditis is found mostly in girls between 10 and 20 years of age.

TIP

Autoimmune thyroiditis is so common in type 1 diabetes that patients are recommended to be screened yearly for thyroid disease with a simple blood test that checks the level of thyroid-stimulating hormone (TSH).

Celiac disease is an autoimmune disease in which antibodies are raised to a protein called gluten in wheat, barley, and rye. The reaction to these foods can cause gastrointestinal symptoms including diarrhea, bloating, and the inability to absorb nutrients from the gut. It is increasingly recognized that children who have type 1 diabetes are at increased risk of celiac disease. A simple blood test can help diagnose the condition, sometimes before symptoms arise, and is recommended.

Appreciating the Value of Team Care

When your child is first diagnosed with diabetes, the stress can be overwhelming. The guilt that comes with this diagnosis may leave you unable to help your child much at first and certainly unable to learn all that you need to know to master the areas of importance to the health of your child.

Therefore, you must depend on the help of a diabetes care team throughout the duration of their childhood, and especially when the diagnosis is first made.

TIP

Another resource that can be tremendously valuable for you and your child is a diabetes summer camp. These camps are located all over the country and provide a safe, well-managed place where your child can go and be in the majority. They can learn a great deal about diabetes while enjoying all the pleasures of a summer camp environment. (Certainly not a minor benefit is the opportunity for you to have time off for perhaps the first time in years.)

You can find an extensive list of camps for diabetic children throughout the United States by going to `www.childrenwithdiabetes.com/camps/`index.htm. It's one of the many services of the Children with Diabetes website.

IN THIS CHAPTER

- Detecting and managing diabetes in the elderly
- Minimizing the risk of heart disease
- Eating and taking medications properly
- Focusing on unique eye problems of the elderly
- Anticipating urinary, sexual, and foot problems
- Understanding treatment options and Medicare coverage

Chapter 15
Diabetes and Healthy Aging

Many countries in the world are experiencing aging populations. Despite improving medical care, longer life spans are often accompanied by an increased burden of chronic disease, including diabetes. Longevity by itself isn't as important as the idea of healthy aging — adding years to life and life to years. We need to approach our later years with an emphasis on the enjoyment of a healthy lifestyle and living our best lives. We deserve to be treated with respect and dignity, especially when it comes to choices in medical care. We should have all the available opportunities to receive appropriate care and at the same time be protected from too much medicine that actually may interfere more with quality of life than it's worth.

Elderly people with diabetes have special problems. Because of those special problems, they're hospitalized at a rate 70 percent higher than the general elderly population. In this chapter, you find out about those problems and the way to handle them.

Diagnosing Diabetes in the Elderly

The incidence of diabetes in the elderly (which is almost always type 2 diabetes) is higher for many reasons, but the main culprit seems to be increasing insulin resistance with aging. Half of the elderly population has prediabetes.

With increasing levels of obesity and poor diet among older people, rates of diabetes are rising. However, as a result of changes in physiology, the body mass index (BMI) isn't a good indicator of obesity in the elderly. The waist circumference is better. A BMI of 30 may not indicate the same level of increased risk of a heart attack in an elderly person as it does in a younger person. A BMI of 30 to 35 is associated with only a slight increase in risk. The pancreas seems to be able to make insulin at the usual rate. The fasting blood glucose actually rises very slowly as you get older. The glucose after meals, however, rises much more quickly and leads to the diagnosis.

Because the fasting blood glucose is usually normal, the hemoglobin A1C (see Chapter 2) is used to make the diagnosis in the elderly population. A hemoglobin A1C that is above 6.5 percent is considered diagnostic of diabetes.

TIP

Treatment goals and targets may be different for older people because of increased side effects of medications and *polypharmacy* — where a person ends up on numerous medications that may interact and have adverse effects. The Diabetes and Aging Study (*Diabetes Care,* June 2011) showed that a hemoglobin A1C of 8 percent was associated with the lowest rates of complications and death in older diabetic patients, whereas a level of less than 6 percent was associated with higher death rates. As a result, most guidelines in the United States and Europe recommend higher acceptable levels of hemoglobin A1C, especially in the elderly who are frailer, to reduce the increased risks of harm from overtreatment. Decisions always need to be tailored to the individual.

REMEMBER

Elderly people with diabetes often don't complain of any symptoms. When they do, the symptoms may not be the ones usually associated with type 2 diabetes, or they may be confusing. Elderly people with diabetes may complain of loss of appetite or weakness, and they may lose weight rather than become obese. They may have incontinence of urine, which is usually thought of as a prostate problem in elderly men or a urinary-tract infection in older women. Elderly people with diabetes may not complain of thirst because their ability to feel thirst is altered.

Evaluating Intellectual Functioning

You need to evaluate the intellectual function of an elderly person with diabetes because managing the disease requires a fairly high level of mental functioning. The patient has to follow a diabetic diet, administer medications properly, and test the blood glucose. Studies have shown that elderly people with diabetes have a higher incidence of dementia (loss of mental functioning) and Alzheimer's disease than nondiabetics, making it much harder for them to perform these tasks.

TIP

A study in *Diabetes Care* in October 2010 indicated that some loss of intellectual function in the elderly was due to large changes in blood glucose during each day. Treatment that moderates these changes may be helpful. Another study in *Diabetes Care*, in November 2008, showed that microalbuminuria (see Chapter 7) was predictive of loss of intellectual function, and drugs that reversed microalbuminuria (ACE inhibitors or angiotensin receptor blockers) were protective.

The patient can take *cognitive screening tests* to determine their level of function. Testing helps determine whether the patient can be self-sufficient or will need help. Many older people who are living alone with no assistance may require more support in the community or to consider admission to a care home.

Considering Heart Disease

The major cause of death in elderly people with diabetes is a heart attack. Strokes and loss of blood flow in the feet are also much more common in diabetics than nondiabetics. Usually, elderly diabetics not only suffer from diabetes but also have high blood pressure and high cholesterol, are overweight or obese, and do little exercise.

After the diagnosis of diabetes is made, it's important to consider lifestyle changes, glucose control, and any other treatments that may reduce the risk of worsening heart disease while adjusting therapies to minimize the risk of unwanted side effects.

Preparing a Proper Diet

Diet and exercise are the foundations of good diabetic care for the elderly just as they are in the younger population. Elderly diabetic patients do disproportionately better with lifestyle change than the younger population. Even light physical

activity significantly reduces the incidence of diabetes, especially among the overweight or obese. Fifteen minutes of moderate walking after meals improved the glucose intolerance of older people with prediabetes.

Diminishing intellectual function can have a negative effect on the diet of elderly people with diabetes, because they may not understand or be able to prepare a proper diabetic diet. The elderly have other problems when it comes to proper nutrition:

- They may have poor vision and be unable to see to read or cook.
- They may have low income and be unable to purchase the foods that they require.
- Their taste and smell may be decreased, so they lose interest in food.
- They often have a loss of appetite.
- They may have arthritis or a tremor that prevents cooking.
- They may have unhealthy teeth or a dry mouth.
- They may simply lose motivation and interest in cooking and preparing food.

Any one of these problems may be enough to prevent the elderly person from eating properly, with the result that the diabetes is poorly controlled.

TIP

Anyone over the age of 65 who has Medicare Part B insurance coverage is covered for the services of a dietitian for *medical nutrition therapy*. Be sure to take advantage of this benefit. The dietitian can analyze the elderly person's current intake and make recommendations to ensure a balanced diet that will help with control of the blood glucose.

Avoiding Hypoglycemia

Older people, who may be somewhat frail, are especially hard-hit by the consequences of hypoglycemia and are especially prone to it because of several factors:

- Their food intake may be uncertain.
- They may be taking multiple medications.
- They may sometimes skip medications.
- They often live alone.

- Their mental state may not permit them to recognize when they're becoming hypoglycemic.
- Their kidney function is often impaired, causing many diabetic medications to last longer than in a younger person.

TIP

The hemoglobin A1C goal for healthy elderly adults is 7 percent. However, if the life expectancy is less than five years, the elderly person is frail, or the risks of intensive therapy outweigh the benefits, the goal is 8 percent. This decreased level of control will help avoid hypoglycemia. Refer to Chapter 4 for more information on hypoglycemia.

Using Medications

Medications that may lower blood glucose to abnormally low levels, such as the sulfonylureas and insulin, are not the drugs of first choice in the elderly. As we explain in the previous section, hypoglycemia hits elderly patients particularly hard and should be avoided if at all possible. With that goal in mind, we explain the proper order of drug usage for elderly diabetics in this section.

WARNING

Elderly people are often on several medications, and in countries where patients pay for medications, the monthly expense for drugs may be great enough to cause them to skip doses or not buy the drug. Compliance with your treatment routine is essential to good health. If you're not taking your diabetes medication(s) as prescribed, you must let your doctor know.

Chapter 12 discusses medications are discussed, but special consideration needs to be made when doctors are prescribing for older patients with diabetes. The following are some commonly prescribed medications:

- Metformin is probably the first drug to try because it doesn't increase insulin secretion (which can lead to hypoglycemia) and because it's inexpensive. Kidney function, which is decreased in the elderly, must be checked when using this drug. The doctor should measure the level of creatinine in the blood. Previously, the drug was stopped if evidence suggested kidney disease. Recent evidence (December 2014 *JAMA Internal Medicine*) supports the use of metformin in patients with mild to moderate kidney disease. The drug should be started at a low dose of 500 mg and gradually increased over several weeks to avoid stomach and intestinal problems. A study in *Diabetes Care* in October 2013 noted that metformin use is associated with reduced mental

function that may be reversed by vitamin B12 and calcium, so these ought to be monitored. In circumstances of an acute challenge to kidney function such as an infection, doses of metformin may need to be reduced or temporarily stopped altogether.

- Sulfonylureas were previously routinely added when a second drug was needed. However, sulfonylureas can cause prolonged hypoglycemia — especially the older drug chlorpropamide. The newer drugs in this category, such as glyburide and glipizide, are preferred, although they're still used with caution, and other classes of medications may be preferred; glipizide may not cause hypoglycemia as often. Your doctor should start you on half of the usual dose and raise it slowly over a number of weeks.
- The sulfonylurea-like drugs called the *meglitinides* (repaglinide and nateglinide) may have an advantage in the elderly because they don't last as long, so any hypoglycemia is shorter lived and more easily reversed.
- New classes of medications described in Chapter 12 are available and some may be suitable for individual older patients. If acceptable control is still not achieved, then you may need to consider insulin. As the dangers of hypoglycemia are higher with insulin, especially short-acting forms, the benefits need to be weighed alongside the potential for risk in the context of an older person's overall quality of life and how the medication will be administered safely.

There is a 20 percent decrease in deaths due to heart attacks in older people with diabetes who take statins, so these drugs are often recommended unless there's a medical reason not to give them. Lowering the blood pressure with drugs also lowers heart attack risk, but no benefit exists in lowering the systolic blood pressure below 140 and excessively low blood pressure can cause falls. The evidence for a beneficial effect of low-dose aspirin in the elderly is uncertain.

Dealing with Eye Problems

Elderly people with diabetes are at risk for the eye problems brought on by the disease, and these problems can affect all aspects of proper diabetes care. Older patients often get cataracts, macular degeneration, and open-angle glaucoma in addition to diabetic retinopathy.

Fortunately, the risk of developing eye diseases associated with diabetes has been found to decrease as people age, at every level of hemoglobin A1C. For example, a 70-year-old with a hemoglobin A1C of 11 is at much lower risk than a 60-year-old with the same hemoglobin A1C.

REMEMBER

An eye examination is recommended every two years if it remains negative for diabetic eye disease. One of the biggest failures in diabetes care is that as many as one-third of the elderly never have an eye examination at all. If no examination is done, how can disease be found early enough to treat? When problems are detected, they can be treated, and the patient's vision can be saved.

Coping with Urinary and Sexual Problems

Urinary and sexual problems are common in elderly people with diabetes and greatly affect quality of life. An older person with diabetes may experience paralysis of the bladder muscle so that urine is retained; when the bladder fills, overflow incontinence is the result. Also, an older person may be unable to get to the bathroom fast enough. Or spasms in the bladder muscle may lead to incontinence. The result may be frequent urinary-tract infections. A urologist may be able to help.

Almost 60 percent of all men over the age of 70 are impotent, and 50 percent have no *libido* (the desire to have sex). The percentages are even higher for diabetic men. These problems can have many causes (see Chapter 6), but older men are especially likely to have blockage of blood vessels with poor flow into the penis. The elderly take an average of seven medications daily, many of which affect sexual function.

To have sex at any age, you need sexual desire and the physical ability to perform, you need a willing partner, and you need a safe, private place. Any or all of these factors may be missing for the elderly.

Treating sexual dysfunction may not be necessary if the male and his partner are okay with the situation. If they aren't, Chapter 6 points out a number of treatments for potency problems.

Monitoring Foot Problems

The risk of foot problems is much higher in elderly patients because they have diminished circulation. It's essential that you examine your feet to check for foot problems, or if your parent or loved one has diminished intellectual function, that you examine their feet daily. Make sure the doctor checks the patient's feet at every visit. Almost half of elderly patients can't see or reach their feet, so someone else must check them.

Most foot problems are reversible if found early. Regular foot doctor visits may be as routine as visits to the dentist. See Chapter 5 for more information on prevention and treatment of foot problems.

Considering Treatment Approaches

When deciding on treatment for an elderly patient with diabetes, a doctor must always consider that individual's unique circumstances. Does this person have a low life expectancy? Or is this person physiologically young, with the possibility of living for 15 or 20 more years? If the patient is only 65 years old and in relatively good health, they have a life expectancy of at least 18 more years — plenty of time to develop complications of diabetes, especially macrovascular disease, eye disease, kidney disease, and nervous system disease. That person may require more intensive diabetes care than someone who is older and has worse overall health.

A study of a large representative population of elderly people with diabetes published in *JAMA Internal Medicine* in January 2015 showed that 51 percent were relatively healthy, 28 percent had intermediate health, and 21 percent had poor health, although the average hemoglobin A1C for the group was 7 percent. This level suggests that many elderly people with complex or poor health are being overtreated and suffering from hypoglycemia. Diabetics in patients older than age 75 have double the rate of emergency department visits for hypoglycemia than the general population.

The level of care provided to an elderly patient may be basic or intensive:

- Basic care is meant to prevent the acute problems of diabetes like excessive urination and thirst. You can accomplish this goal by keeping the blood glucose under 200 mg/dl (11.1 mmol/L). Basic care is used for an elderly person with diabetes who isn't expected to live very long, either because of the diabetes or other illnesses.
- Intensive care is meant to prevent diabetic complications in an elderly person expected to live long enough to have them. The goal here is to keep the blood glucose under 140 mg/dl (7.7 mmol/L) and the hemoglobin A1C as close to normal as possible while avoiding frequent hypoglycemia. Elderly patients who have had diabetes for 20 or more years have a higher death rate when treated intensively.

TIP

The benefits in terms of preventing complications of diabetes are much greater when the hemoglobin A1C is lowered from 11 to 9 than when it's lowered from 9 to 7. The goal of treatment for many elderly people can be set higher in order to avoid hypoglycemia.

Treatment always starts with diet and exercise. Education about both can be of great value, especially if the patient's spouse is also involved.

Exercise may be limited in the elderly person with diabetes. Recent studies have shown that exercise is helpful even in the very old because it reduces the blood glucose and the hemoglobin A1C. However, because elderly patients have more coronary artery disease, arthritis, eye disease, neuropathy, and peripheral vascular disease, exercise just may not be possible.

TIP

If an elderly patient can't walk at all, they may still be able to do resistance exercises sitting in a chair. These exercises increase strength and lower the blood glucose.

When diet and exercise are inadequate to control an elderly patient's diabetes, medications must be added.

Understanding the Medicare Law

In 1998, the federal government began to offer benefits for the 4.2 million people with diabetes who are eligible for Medicare (over age 65). Under the policy, all people with diabetes enrolled in Medicare Part B or Medicare Managed Care are eligible to receive coverage of glucose monitors, test strips, and lancets. It doesn't matter which method they use to control their disease. If your doctor determines that you meet all the coverage requirements, Medicare also covers continuous glucose monitors.

TIP

If you're enrolled in Medicare, you can get these benefits by having your physician prescribe the supplies and document how often you use them.

The Health Care Financing Administration, which administers Medicare, has also passed regulations that permit people with diabetes to be reimbursed for education programs. In addition, if you have Medicare insurance and have type 1 diabetes, you're eligible for Medicare to pay for your insulin pump.

To find out more about Medicare, call the Medicare Hotline at 800-633-4227. The government provides a hotline for the hearing-impaired at 877-486-2048. For a complete rundown of Medicare coverage of diabetes supplies and services, go to `www.medicare.gov/Pubs/pdf/11022-Medicare-Diabetes-Coverage.pdf`.

IN THIS CHAPTER

- Following airline regulations
- Being denied certain jobs
- Finding the law on your side
- Working the medical-insurance system
- Maintaining coverage when your employment changes
- Obtaining long-term care and life insurance

Chapter **16**

Dealing with Occupational and Insurance Problems

This chapter provides a guide to navigating your way through issues of traveling and working with diabetes. We also discuss access to healthcare and insurance.

Diabetes is a global disease, with regulations, laws, and healthcare systems varying from country to country. We focus on the most pressing issues for people in the United States as an example of the challenges but also the progress being made to reduce unacceptable discrimination and disadvantages people with diabetes may face.

As a person with diabetes, when you try to get a job, you may run into various forms of discrimination. Part of the problem for companies that provide health

insurance is the fear that they'll have to pay higher insurance premiums if employing a person with a chronic illness. Part of the problem is a lack of understanding of the great strides that have been made in diabetes care so that a person with diabetes often has a better record of coming to work than a nondiabetic.

In this chapter, you find out what you need to know when you travel, apply for work, health insurance, and life insurance. You discover how to work the healthcare system so that you derive the greatest benefits possible at the lowest cost.

Traveling with Diabetes

Whether you travel for your job or for pleasure, if you need insulin injections and must carry syringes and needles, you have to follow the rules of the Transportation Security Administration (TSA) if you fly within the United States. Airlines outside the United States may have different rules; check with your airline before you travel overseas.

The TSA instructs that you should "make sure injectable medications are properly labeled (professionally printed label identifying the medication or a manufacturer's name or pharmaceutical label). Notify the screener if you are carrying a hazardous waste container, refuse container, or a sharps disposable container in your carry-on baggage used to transport used syringes, lancets, etc." Updated information is available at the TSA website: `www.tsa.gov/blog/2020/11/13/travel-tip-traveling-diabetes.You` can also call the TSA call center at 855-787-2227.

The TSA permits prescription liquid medications and other liquids needed by persons with disabilities and medical conditions, although it's a good idea to check with your airline to determine what type of documentation they need. It's always a good idea to carry doctors notes and prescriptions with you just in case. These items include

- All prescription and over-the-counter medications (liquids, gels, and aerosols), including personal lubricant, eye drops, and saline solution for medical purposes
- Liquids, including water, juice, or liquid nutrition or gels for passengers with a disability or medical condition
- Life-support and life-sustaining liquids such as bone marrow, blood products, and transplant organs

- Items used to augment the body for medical or cosmetic reasons, such as mastectomy products, prosthetic breasts, bras or shells containing gels, saline solution, or other liquids
- Gels or frozen liquids needed to cool disability or medically related items used by persons with disabilities or medical conditions

REMEMBER

If the liquid medications are in volumes larger than 3 ounces each, they may not be placed in the quart-size bag used for personal liquids of less than 3 ounces. They must be declared to the Transportation Security Officer. Carry a doctor's note or prescriptions with you as necessary. Some airports now have scanning technology that permits larger quantities of liquids to be carried without specific permission. The UK Government, for example, says that passengers are currently required to remove tablets, laptops, and liquids from their cabin baggage, whereas liquids have been limited to 100ml and must be in a clear plastic bag. This requirement will eventually be lifted, and the 100ml liquid container limit will be extended to 2 liters. Airports have until June 2024 to upgrade their screening equipment and processes.

Specifically with respect to medications for diabetes, notify the Security Officer that you have diabetes and are carrying your supplies with you. (Medication and supplies you're going to use should be in your carry-on luggage.) The following diabetes-related supplies and equipment are allowed through the checkpoint after they've been screened:

- Insulin and insulin-loaded dispensing products (vials or box of individual vials, jet injectors, biojectors, EpiPens, infusers, and preloaded syringes)
- Unlimited number of unused syringes when accompanied by insulin or other injectable medication
- Lancets, blood glucose meters, blood glucose meter test strips, alcohol swabs, meter-testing solutions
- Insulin pump and insulin-pump supplies (cleaning agents, batteries, plastic tubing, infusion kit, catheter, and needle; insulin pumps and supplies must be accompanied by insulin)
- Glucagon emergency kit
- Urine ketone test strips
- Unlimited number of used syringes when transported in sharps disposal container or other similar hard-surface container
- Sharps disposal containers or similar hard-surface disposal container for storing used syringes and test strips

TIP

Here are some suggestions for managing your diabetes if you're changing time zones:

- Obtain a list of doctors in the countries you'll visit who speak your language. To find English-speaking doctors, you can contact the U.S. embassy in each country. There are further resources for travelers at the website of the International Association for Medical Assistance to Travelers at `https://iamat.org/`.
- If using an insulin pump, change the basal hourly rate to the same dose every hour so that whether it's 8 a.m. or 8 p.m., the same dose is given. When you arrive in the new time zone, you can adjust the basal rate back to your usual doses.
- If you use long-acting insulin, change a single dose to two half doses 12 hours apart.
- Stick to your regular schedule using local time for any oral medications.

REMEMBER

Wherever you go, make sure you wear a bracelet or necklace that identifies you as a person with diabetes.

Understanding Employment Restrictions

In some countries, certain occupations exclude people with diabetes. For example, in the United States, the Federal Bureau of Investigation (FBI) has had a policy called a blanket ban on hiring certain groups of people, including people with diabetes who take insulin. A blanket ban doesn't take into account the condition of the individual, the past employment history, the way the person manages their diabetes, or the responsibilities of the position. It simply says, in effect, "You've got the disease, so you can't work here." This policy is a throwback to the days before 1980, when a person with diabetes could never be sure what his blood glucose was doing.

Another important institution that has a blanket ban in place is the United States military. If you have any kind of diabetes, you're not eligible to serve. If you develop diabetes after you've been in the military, you'll probably be discharged. This policy doesn't make a lot of sense because many countries have people with diabetes in their military forces and have no difficulty with them, so perhaps someday this policy will be updated.

Fortunately, legal challenges and a reduced level of prejudice are now resulting in withdrawal of many discriminating rules where it can be shown that optimum control of diabetes is entirely consistent with safe performance in the workplace. Blanket bans — policies that restrict an individual's ability to work for an

organization or employer because of their disability — are now illegal with notable exceptions such as the U.S. Military Services. With supportive medical evidence showing safe control of diabetes, progress has been made in allowing employment as police officers, IRS agents, mechanics, court security officers, FBI Special Agents, and plant workers. The Department of the Treasury lifted a blanket ban on becoming a member of the Bureau of Alcohol, Tobacco, and Firearms if you have insulin-requiring diabetes. Several states have lifted a ban on hiring people with diabetes to be school-bus drivers. This action resulted from lawsuits against several school districts that fired drivers with spotless driving records just because they had diabetes. (This reversal doesn't mean that no safeguards against risky drivers exist. Drivers are being evaluated on a case-by-case basis before they're accepted to drive children, which is fair.)

Previously, commercial drivers with diabetes could drive within a state but couldn't cross state lines. Now the Department of Transportation (DOT) looks at people with diabetes on a case-by-case basis to determine whether they're fully able to drive commercially from state to state. As long as the person has no history of hypoglycemia with unconsciousness, the DOT grants an exemption that permits the individual to drive between states, with reconsideration taking place every two years.

At one time, people with diabetes who took insulin were banned from becoming firefighters. Now they're permitted to serve in this work, too, on a case-by-case basis. However, the rule says they must have a hemoglobin A1C of less than 8 percent.

Another blanket ban that has fallen is the ban on piloting airplanes. For 37 years, a person who took insulin couldn't fly a plane. In 1996, the Federal Aviation Administration (FAA) reconsidered its ban based on the great advances in controlling diabetes. The FAA decided to permit people to fly privately but not for commercial airlines. Even if they have a private license, however, they can't use it outside the airspace of the United States. Applications for a pilot's license are evaluated on a case-by-case basis.

Becoming Familiar with Workplace Law

A number of laws protect you in the workplace if you work in the United States, but the most important is probably the Americans with Disabilities Act (ADA) of 1990. This act states,

> *The determination that an individual poses a "direct threat" shall be based on an individualized assessment of the individual's present ability to safely perform the essential functions of the job.*

TIP

In 1998, the U.S. Court of Appeals ruled that the ADA protects Americans with diabetes. The act applies to employers with 15 or more employees. What the ADA means is that you're qualified for a particular job if you can perform the essential functions of the job as determined by the employer, with or without reasonable accommodation. Therefore, you can't be discriminated against in hiring, firing, promotion, training, pay, or any other aspect of employment because you have diabetes. Your boss can't ask whether you have diabetes but can expect you to pass a physical examination to verify that you are well enough to do the job.

The Federal Rehabilitation Act of 1973 is an important law that protects you when you apply for a federal job or a job in a company that receives federal assistance. A person with diabetes is specifically protected under this law. The most important provision states,

> *No otherwise qualified handicapped individual in the United States shall, solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity conducted by the Executive agency. . . .*

To exclude you, federal agencies have to prove that you won't be able to perform safely if given the job. That proof is hard to come by and puts the burden on them, not you. They must decide on a case-by-case basis. As noted earlier in the chapter, the FBI and the military are exempt from this law.

TIP

What can you do if you run into discrimination on the job due to your diabetes? You can contact the American Diabetes Association `www.diabetes.org` at 800-DIABETES (800-342-2383) to request a free packet of information, plus assistance from a legal advocate in the United States. Globally, please check with your national diabetes associations or employment commission.

Laws similar to what we describe in this section apply in many other countries. If you feel that you've been discriminated against due to your diabetes, it's important to access help and support from organizations that support citizens' rights or a union or seek direct legal advice.

Navigating Your Healthcare System

Everyone should have the right to access medical care, and one of the most important measures of a country's progress is its commitment and ability to look after its most vulnerable citizens. Medical care shouldn't be based on ability to pay.

Of course, some treatments for diabetes can be very expensive, and there are limits to the funding available to pay for them. Inevitably, insurers may place restrictions on access to certain therapies, and governments who fund "universal healthcare, free at the point of delivery" may curb specified procedures, medicines, or medical equipment especially if it has failed to measure up to criteria for cost effectiveness. Such systems ensure that a doctor's decisions, shared with you as the patient, are based on what is likely to be best for you, irrespective of wealth, though that may be constrained by rationing decisions made at a national or regional level.

People with diabetes can have very different experiences of care depending on where they live and their socioeconomic status. Medical care can be too expensive for many, insurance charges prohibitively high, government healthcare systems constrained by funding, or the physical access to treatments may be limited.

Health inequality is an injustice that is deeply rooted and has devastating effects on outcomes for individuals around the world. Poverty, poor housing, and low levels of education contribute to a person's risk of developing diabetes and other chronic health conditions as well as access to treatment, dramatically affecting life chances and longevity. Action on these factors and other social determinants of health, should be a priority for public health and for policy makers.

In some countries, only private medical care exists, whereas other countries have combinations of insurance and state-funded systems, sometimes from general taxation administered through central government, with other countries choosing state-sponsored insurance programs.

Whichever system applies to you, it's important to know how to get the best treatment available.

Changing or Losing a Job

One of the major reasons people with diabetes used to stay in jobs they didn't care for was their fear of losing their health insurance. These days, this worry doesn't have to stop you because several laws protect you from the loss of health insurance if you change or lose your job.

The Consolidated Omnibus Budget Reconciliation Act (COBRA) stipulates that your employer must keep you on your current health insurance for as long as 18 months after your job ends and longer if you're disabled. If your child is at the age when

they're no longer covered under your policy, their coverage can continue for up to three years. You, rather than your employer, have to pay the premiums for this continued insurance. The other way to continue health insurance if you lose your job is to buy it from your state's insurance marketplace.

TIP

If you're leaving work because of retirement at age 65, sign up for Medicare without fail. It's a generous program (which you supported while you were working) that recognizes the specific needs of people with diabetes. Since 1998, Medicare has expanded its coverage to include blood glucose monitors and test strips after your physician certifies the need. It also offers payment for specific types of outpatient diabetes education programs, as long as they're considered necessary by your physician. And recently it has begun to pay for nutrition counseling and eye examinations. Most plans pay for an insulin pump, insulin, and syringes. To find out more about Medicare, call the Medicare Hotline at 800-633-4227. The government provides a hotline for the hearing-impaired at 877-486-2048.

Considering Long-Term Care Insurance

People with diabetes are living longer and longer, and you're going to need a way to pay for your care when you can no longer pay health-insurance premiums. When you're 90, your 88-year-old spouse will most likely not be in a position to pay for your insurance, nor will your 65-year-old child. Medicare doesn't cover most of your long-term care expenses. Medicaid does cover some long-term care, but not everything you may need. This is where long-term insurance may help, if you can afford it. Obama's Healthcare Act stepped in here by allowing payment of monthly premiums through payroll deduction to buy long-term care as of January 2011.

If you have plenty of money and want to protect it from the financial hit of a long-term illness, long-term insurance is for you. If you have little money, then the years of premiums are going to wipe out your savings, and you may end up needing to drop the policy before you even use it.

One big problem is that many companies that sell long-term insurance don't cover people with diabetes. If you can get this type of insurance coverage while you're still working, you may be able to get into a large group where your particular illness isn't considered and the premiums may be relatively low. However, you'll obviously be paying those premiums for a longer time than if you start coverage when you're older.

TIP

Before you buy, you should check several important features of a long-term care insurance policy:

- What are the *benefit triggers* — the physical limitations that trigger coverage? To make this determination, generally insurance companies look at activities of daily living, such as the ability to bathe yourself, dress yourself, eat without help, go to the bathroom, and get out of bed. When you can't perform one or more of these tasks, benefits begin.
- How much of the cost of care does the insurance pay, some or all?
- What levels of care does the policy provide? Your policy may offer coverage only for adult day-care services or may cover anything up to and including living in a nursing facility.
- Is a waiver of premiums built in so that you don't have to pay premiums when you're disabled?
- Is the policy guaranteed renewable so you can renew no matter whether you use it, although the premiums will be higher?

Whatever you do, if you buy long-term care insurance, make sure you take good care of yourself so you live long enough to get some benefit from it.

Shopping for Life Insurance Anywhere

As you may expect, the situation with life insurance and people with diabetes is in a state of flux. Insurance companies like to calculate your chance of dying and charge you (or turn you down) based on those calculations. Many companies are using calculations based on the life span of people with diabetes in 1980 or before. Using those statistics, those with diabetes clearly died earlier than their friends who don't suffer from diabetes. Thus, the cost of life insurance is greater for people with diabetes than those who don't suffer from it.

As new studies are done, they should indicate that the life spans of people with diabetes and those without are approaching equality. In some cases, people with diabetes, who take better care of themselves than people without a chronic illness, are living even longer. So the situation is improving, and insurance companies will catch up sooner or later. Can you imagine the surprise if insurance companies were ever to charge people with diabetes less than others because of their good habits?

TIP

Insurance companies look at levels of blood glucose and the hemoglobin A1C. Try to get yourself in excellent control before you apply. You may be able to save a bundle or get your insurance much more easily.

With the internet, you can quickly find and compare the cost of insurance at numerous companies based on your age; your habits (warning: If you smoke, you pay through the nose); and the presence of conditions such as diabetes, high blood pressure, and high cholesterol. Many companies take a standard rate for a healthy person with no diseases and add 50 percent more if you have diabetes. Of course, your actual cost depends on your specific circumstances, including your age when you first buy the insurance.

IN THIS CHAPTER

- Choosing the right medications
- Exploring studies that may someday lead to changes in treatment
- Investigating the link between heart disease and diabetes

Chapter 17

Eyeing What's New in Global Diabetes Care

Research continues to reveal new discoveries that help us know even more about the genetic and environmental factors involved in diabetes. As scientists gain greater insight, it helps in the development of new treatments and informs doctors about the best ways to manage the condition. Most importantly, a greater understanding of the disease helps us all to realize how we may prevent diabetes, optimize blood sugar levels, and maximize benefits of treatment to prevent complications and support friends and loved ones who have been diagnosed with diabetes.

TIP

New developments can come in many forms. Whether it's a new diet or a novel medication, there are often commercial interests involved in promoting the claimed benefits. Ask these questions before trying or accepting any new lifestyle advice or treatment:

- What is the source of the new advice, and is that source professionally regulated?
- Is it reliable, evidence based, and credible?
- What are the costs of any new treatment?
- What are the benefits and risks, and are they fully understood?
- Does your diabetes team support the new treatment?

Protecting Yourself from the Dangers of New Drugs

Chapter 12 explores some of the advances in drug treatments for diabetes. Some medications have been shown to have significant benefits and can dramatically reduce the risk of complications. These medications have saved countless lives and have protected millions of people around the world from debilitating illness. Other drugs haven't met the expectations of initial marketing claims, and many have been withdrawn from the market when unacceptable risks have been witnessed "in the real world" after they've been granted a license for use.

To make an informed choice about novel medications, it's important to balance optimism about the potential advantages with a degree of "healthy skepticism."

In an effort to instantly gratify their stockholders and find the next "billion dollar drug," drug companies seem to have lost sight of their major goal, which is to find drugs that are both effective and safe for the treatment of diabetes.

Although some drug companies continue to pursue this goal, many of them are guilty of the following misconduct:

- Withholding studies that they have paid for that show that their drugs aren't as effective as they claim.
- Strongly advertising the one study that shows positive effects when many others show negative effects.
- Withholding studies that indicate their drugs may have dangerous side effects.
- Promoting their drugs for purposes that aren't permitted by the FDA.
- Advertising their drugs as though they're the best or only treatment when older and better treatments exist.
- Providing catered lunches and samples to doctors to convince them to use their drugs. A basic conflict of interest exists in the relationship between doctors and pharmaceutical companies.
- Paying large sums of money to private doctors to do "studies" of their drugs that rarely find negative things about the drugs.
- Paying rebates to private doctors to use their drugs, whether they're the best choice for the patient.

These problems aren't limited to doctors and the pharmaceutical industry. Any time "advisors" are also salespeople, they advise the purchase of what they sell. But

just because this practice takes place in every industry doesn't make it right. The regulation of these relationships varies from country to country, but irrespective of where you are in the world, you have the right to expect the healthcare professionals involved in your care to act with honesty, respect, transparency, and integrity at all times. The duty of any healthcare provider is to make the care of the patient the first concern. In other words, they should always act first in your interests.

What steps can you take to avoid the dangers we outline in this section? Here are a few suggestions:

- **Don't ask your doctor to prescribe new drugs that are heavily promoted by advertising.** Too few people have used them and too little time has passed to truly know the potential of these new drugs.
- **Don't take samples from your doctor.** Drug companies use samples to get you and your doctor hooked on their drug.
- **Don't ask for a drug just because a key organization like the American Heart Association, the American Diabetes Association, the Endocrine Society, or others promotes the drug.** These organizations and their equivalents in other countries can provide helpful advice and guidance; however, many have a codependent relationship with drug companies that provide them with financial support and sponsorship. Sometimes this can result in a conflict of interest.
- **Do consider waiting before trying a new drug.** Discuss any new medication options with the professionals involved in your care. If you already have good control of your diabetes, it may be wise to keep on this regime until the safety profile and advantages of any new drug have been firmly established.

Checking the Role of the Microbiome in Type 1 and 2 Diabetes

Obesity has been found to change the composition of the bacteria in the human intestine. These bacteria increase the absorption of food from the intestine, resulting in more obesity. When bacteria from lean men are transplanted into the intestine of men with metabolic syndrome, the recipients show increased insulin sensitivity — an improvement in their condition. By examining the intestinal bacteria of people at high risk for diabetes, researchers may be able to predict the future development of diabetes.

Transplantation of intestinal bacteria has been successful in treating a highly pathological organism called *Clostridium difficile*, which causes severe inflammation of the colon. More recently, it has successfully treated other chronic gastrointestinal infections. Changing the intestinal bacteria in a person with type 1 and 2 diabetes may prove to be another weapon in the arsenal of the diabetes specialist.

TIP

The increasing awareness of the role of healthy gut bacteria — the microbiome — in the prevention of obesity and type 2 diabetes provides opportunities for experiments like those described here. It's more important for you right now to be aware that particular foods and dietary habits can nurture a healthier and more diverse microbiome in the first place. We discuss this in more detail in Chapter 8.

Eating One Meal a Day to Control Diabetes and Other New Dietary Advice

Diabetes doctors have been looking for the best way for type 2 diabetics to eat to control their diabetes. A group in Sweden published its study in *PLoS ONE* in November 2013 comparing three different diets: a low-fat diet, a low-carbohydrate diet, and the Mediterranean diet. The first two were spread over three meals, whereas the Mediterranean diet was a single large lunch with red wine. The researchers looked at the effects of these diets on blood glucose, blood fats, and other hormones.

Although the low-carbohydrate diet reduced glucose more than the low-fat diet, the low-carbohydrate diet resulted in a higher level of a fat called triglyceride. The Mediterranean diet induced the least increase in glucose. The traditional Mediterranean diet didn't include breakfast. Thus, the authors of this study suggest that the person with type 2 diabetes should reconsider their meal arrangements and perhaps limit meals to one a day, though it may be best to take the opportunity to focus on the timing and quantity of food and the ingredients themselves rather than restricting oneself to a single meal. A single meal a day isn't suitable for people in treatments including insulin, which risks hypoglycemia.

This example is one of numerous studies looking at diet, which we discuss in greater detail in Chapter 8. We still have much to learn, and there is scope for nutritional science to identify the components in our diet that positively or negatively influence weight, insulin sensitivity, and glucose control, as well as having broader effects on health. Influencers on social media, some more qualified than others, often promote diets, some of which have little evidence to back up their claims and may even be harmful. It's important to remember that the effects of dietary changes

may differ between individuals, but the wisest advice is to avoid fad diets and to eat a healthy Mediterranean diet with moderation in quantity and reduced high glycemic carbohydrates, sources of added sugars, and processed foods.

Losing Weight with Gastric Artery Embolization

Left gastric artery embolization, which means closing off the left gastric artery (the artery to the stomach) with some obstructive agent, results in a significant loss of weight. Patients who had this procedure lost 8 percent of their body weight compared to patients who had other arteries to the stomach shut off. The explanation may be that the left gastric artery supplies the part of the stomach that makes *ghrelin,* a hormone that stimulates appetite. Embolization probably suppresses ghrelin.

The study at Harvard Medical School was presented at the meeting of the Radiological Society of North America in November 2013. Fifteen patients underwent left gastric artery embolization for the treatment of bleeding from the stomach. Researchers then reviewed the patients' records after the procedure. They found that the patients who had gastric artery embolization lost a mean of 7.9 percent of their body weight within three months. The authors suggested that the study needed to be repeated with a larger group where the patients were randomly assigned to one procedure or another.

Following further studies and correspondence published in the *Journal of the American College of Cardiology* in 2020, it can be concluded that there may be a place for such surgery where more invasive bariatric surgery isn't indicated or considered safe. It shouldn't replace lifestyle interventions as the preferred approach to weight management and should continue to be viewed with caution as the long-term success, risks, and effects on type 2 diabetes are yet to be fully understood.

Blocking the Vagus Nerve for Weight Loss

Cutting of the vagus nerve was once used for the treatment of stomach ulcers. These patients commonly lost weight after the procedure.

In January 2015, the Food and Drug Administration approved an implanted device for the treatment of obesity called the Maestro System. Implantation takes 60 to 90 minutes and is done on an outpatient basis. The rechargeable device is

implanted along the left side of the chest with electric leads that surround the vagus nerve, a nerve that runs along the stomach. It may be used for people with a BMI of 40 or greater, or those with a BMI of 35 to 40 plus another cardiac risk such as high blood pressure, high blood fats, or diabetes. The Maestro System doesn't sever the vagus nerve but blocks it on a daily schedule to reduce hunger.

The device was shown to work in a study of 239 people, with 162 receiving the active device and 77 receiving a placebo operation. Those who had the active operation lost 24.4 percent of their excess body weight whereas those who had the placebo operation lost 15.9 percent of their excess body weight.

People who had the active procedure had a 3.7 percent adverse reaction rate consisting of mild or moderate heartburn or abdominal pain.

The two main studies so far, called the EMPOWER and Recharge studies, showed some weight loss, but long-term sustainability, cost effectiveness, and effects of diabetes remained unclear. The availability of devices has also been limited.

Using an Endoscopic Duodenal-Jejunal Bypass Liner for Weight Loss

In Chapter 12, we discuss metabolic surgery as a cure for diabetes. Specialists have been trying to find a substitute for surgery that will accomplish the weight loss and have a positive effect on type 2 diabetes without the cutting.

The duodenal-jejunal bypass liner is a sleeve that doesn't allow food to pass through to be absorbed. It's delivered to the beginning of the small intestine using an *endoscope,* a tube that goes through the mouth, through the stomach, and into the small intestine.

It was shown to be effective in a study involving 77 obese patients. Thirty-eight had the sleeve inserted and were placed on a diet, whereas 39 other patients followed the diet but didn't have the sleeve inserted. After six months, those patients with the sleeve had lost 32 percent of their excess weight, whereas those patients without the sleeve lost 6.4 percent of their excess weight. The hemoglobin A1C improved to 7 percent in the sleeve group but only 7.9 in the other group.

Adverse reactions included upper abdominal pain, back pain, nausea, and vomiting, none of which were severe. However, the device had to be removed in one patient due to gastrointestinal bleeding and two patients due to migration of the liner down the intestine.

The duodenal-jejunal bypass liner has the added advantage of being reversible. It may be removed at any time in the same way it was inserted.

Placing a Gastric Balloon

The gastric balloon is yet another attempt to accomplish the benefits of surgery without the cutting. A balloon is placed in the stomach and filled with a salt solution to keep it in place. The result is similar to the adjustable gastric band discussed in Chapter 12. The capacity of the stomach is greatly diminished so that the patient eats much less and loses weight.

Past problems with the balloon occurred when the balloon burst and passed into the intestine, blocking the bowels. A new version called the ReShape Duo overcomes this problem by using two connected balloons. If one bursts, the other prevents the other balloon from entering the intestine. The liquid in the balloon contains a dye that is absorbed and turns the person's urine blue, alerting the patient to the rupture and allowing the physician to remove the balloon and replace it.

The balloons are removed after six months to reduce the risk of stomach ulcers that result from friction with the stomach. They may be particularly useful in people who need quick weight loss for heart surgery or cancer treatment but are too sick to have real metabolic surgery.

People who used the balloons plus lifestyle change lost 28.5 percent of their excess weight compared to an 11.3 percent excess weight loss for people who did lifestyle change only.

On August 5, 2015, the FDA approved the ORBERA Intragastric Balloon System after studies showed that although the balloon must be removed after six months, significant weight loss continues for a year or longer. Some people with diabetes may benefit from this treatment.

Understanding the Importance of the ACCORD Trial

The ACCORD (Action to Control Cardiovascular Risk in Diabetes) trial is a study of 10,250 people who have had type 2 diabetes and are at high risk to have a heart attack. The average hemoglobin A1C was 8.2 percent, which is higher than the

average patient with type 2 diabetes. The patients were randomized into two treatment arms: a standard treatment arm that had a goal of an A1C target between 7 and 7.9 percent and an intensive treatment arm that had a goal of an A1C target less than 6 percent.

TIP

The ACCORD trial results were published a number of years ago, but its findings remain relevant because they changed the way in which doctors treat high-risk patients. All new developments in diabetes care must be considered in the context of these findings. Personalized targets and individually tailored management plans become even more important in light of these results.

All patients already had known heart disease, diabetes, and at least two of the following additional risk factors:

- High blood pressure
- High cholesterol
- Obesity
- Smoking habit

When patients with these characteristics are allowed to maintain their usual A1C of 8.2 percent, their death rate is 50 per 1,000 patients per year.

The study was due to be completed in 2010, but in early February 2008, the researchers announced that they were closing the part of the study that attempted to get the A1C down to 6 percent because there was a higher death rate among the intensively treated patients than the other group. Here were the results up to that point:

- The intensive group had an average A1C of 6.4 percent.
- The standard group had an average A1C of 7.5 percent.
- The standard group had a death rate of 11 per 1,000 patients per year.
- The intensive group had a death rate of 14 per 1,000 patients per year.

Therefore, although the death rate for both groups was far below the level for these people with an A1C of 8.2 percent initially (11 or 14 versus 50 per 1,000), the intensively treated group that reached their goal had a slightly greater death rate than the standard group that reached their goal.

Subsequent papers from this study published in the *New England Journal of Medicine* in April 2010 have shown the following information:

- The use of combination therapy with a statin drug and a fibrate (see Chapter 11) didn't reduce the rate of fatal heart or nonfatal heart attacks or strokes compared with a statin alone in these high-risk patients.
- Targeting a blood pressure of less than 120 mmHg didn't reduce the risk of fatal and nonfatal major heart attacks compared to a blood pressure target of 140 mmHg in these high-risk patients.

REMEMBER

The moral of this story isn't that intensive treatment is dangerous in type 2 diabetes but that intensive treatment is dangerous in this population of high-risk patients with heart disease and other risk factors.

Note that the death rate for both groups is much lower than that of the poorly treated patients. These patients are so sick that the difficulties associated with trying to keep their blood glucose at a level of 100 mg/dl all the time may be too great.

TIP

The more you control your blood glucose early in diabetes, the less chance that you'll get to the point of the patients in this study.

Reviewing Developments in Gene and Stem Cell Therapy

In Chapter 3, we discuss the combination of genetic and environmental influences that may predispose individuals to develop type 2 diabetes. Gene therapy involves replacing or altering "faulty" genes related to the risk of developing a disease. The new genetic material can be inserted into cells via a "vector" that may be an otherwise harmless virus. Experiments in laboratory animals have shown promise, with genetic material introduced into mice resulting in weight loss and improved insulin sensitivity. The challenge for this kind of therapy for type 2 diabetes is that the disease isn't caused by a single defective gene but is influenced by numerous genes relating to glucose control, insulin production and action, the activity of other related hormones, as well as the predisposition to complications of diabetes.

Stem cell therapy for type 1 or type 2 diabetes is in the early stages of development for practical applications. Stem cells are cells that are as yet undifferentiated, meaning they have the potential to become cells with specialized functions. Researchers are investigating the possibility of introducing stem cells into the pancreas and "programming" them to become insulin-producing beta islet cells

so that they enhance insulin response. This may prove more effective than transplanting fully established pancreatic islet cells that has also been the subject of trials in people with type 1 diabetes but that has the disadvantage of needing suppression of the immune system to prevent rejection of the foreign cells.

Investigating Immunotherapy

Another promising new approach for type 1 diabetes is immunotherapy. Type 1 diabetes is an autoimmune condition where insulin-producing pancreatic islet beta cells are attacked by an aberrant immune system response. Immunotherapy for type 1 diabetes may involve reprogramming the immune system to stop the process of islet cell destruction so that type 1 diabetes may be amenable to treatment of its root cause or even prevented.

In November 2022, the FDA approved the first ever immunotherapy called teplizumab (trade name Tzield) for adults and children over 8 years showing early warning signs of developing type 1 diabetes. This has been heralded as the most important breakthrough in the treatment of type 1 diabetes since the discovery of insulin 100 years ago. It has been shown to significantly delay the onset of type 1 diabetes and trials are ongoing to see if it might lessen the severity of type 1 diabetes if it is given early in the illness to protect remaining beta cells from further damage.

Examining the Relationship between Novel Viruses and Diabetes

Most developments in diabetes result from research to find better strategies to prevent and treat diabetes. There is always hope that scientists will deliver a major breakthrough in diabetes care, although some new treatments don't live up to early expectations. However, late in 2019, news began to emerge of the rapid spread of a novel coronavirus that came to be called COVID-19, which was clearly an unwelcome global development for people with diabetes. Over the next few years, it became clear that people with certain preexisting conditions, including diabetes and obesity, were much more likely to suffer severe illness, particularly with the more dangerous variants of the evolving virus.

Vaccination and early intervention with treatments such as antivirals can protect the most vulnerable to some degree, but the lessons from the COVID-19 pandemic are clear. Most people living with diabetes manage the virus with similar relatively mild symptoms to people without diabetes, but severe illness with a novel virus such as COVID-19 should be regarded as a newly relevant short-term complication of diabetes for some.

The exact reasons for the worse prognosis aren't fully understood, but it's also of concern to people who have other conditions, some of which may go along with diabetes, such as heart disease, high blood pressure, and chronic kidney disease. The infection can result in loss of control of blood glucose but is also associated with a severe inflammatory response in COVID called the cytokine storm. There are probably a number of factors that predispose people with diabetes to more extreme effects of the virus. It is important for people with diabetes to follow infection control guidelines, to optimize diet and glucose control, and to seek medical advice if concerned.

5 The Part of Tens

IN THIS PART . . .

Observe ten important commandments for excellent diabetes care to help manage your condition and lead your best life.

Debunk common myths about diabetes so that you aren't confused about them.

IN THIS CHAPTER

- Understanding the importance of monitoring, eating well, testing, and exercising
- Solidifying prevention with medication (if needed), a positive attitude, and planning

Chapter 18
Ten Commandments for Excellent Diabetes Care

Living your best life with diabetes isn't as daunting as it may seem. When you commit to the possibility of good health, you can look forward to many advantages. With the ten easy steps in this chapter as a guide, you'll be able to feel better and prevent further complications down the road.

Adding new tasks into an already busy life is never easy, but if you prioritize feeling good, you'll see that the steps in this chapter offer a high return on your investment of time and effort. We recommend easing into the various "commandments." Change is difficult for everyone. Give yourself a few weeks to adjust to each activity before you try to add a new one. Keep in mind that it takes 30 days to make an action a habit. Therefore, once the first month is over, it will get easier, and you'll be well on your way to better health.

A Positive Attitude

Your approach to disease can go a long way toward determining how well you live with your diagnosis. If you have a positive attitude and treat diabetes as a challenge and an opportunity, actually produces beneficial chemicals that make managing

the disease easier. A negative attitude, on the other hand, results in the kind of pessimism that leads to failure to diet, failure to exercise, and failure to take your medications. Plus, your body makes chemicals that are bad for you when you're depressed.

Diabetes is a challenge because you have to think about doing certain things that others never have to worry about. Diabetes may help you tap into your organizational skills, which can then be transferred to other parts of your life. When you're organized, you accomplish much more in less time.

Diabetes offers you opportunities to make healthy choices for your diet as well as your exercise. You may end up a lot healthier than your neighbor who doesn't have diabetes. As you make more and more healthy choices, you feel and test less and less like a person with diabetes.

Proper Nutrition

If you are what you eat, then you have the ability to choose foods that help your body heal and stay balanced. Keep in mind that if you gain weight, you gain insulin resistance, but a small amount of weight loss can reverse the situation. A diabetes-friendly eating plan doesn't have to be a sentence to be excluded from communal meals and gatherings. The same foods that are advisable for someone with diabetes are also beneficial to anyone seeking to achieve optimal health. Refer to Chapters 9 and 10 to find out more about the best eating plans for people with diabetes. It's entirely possible and desirable to enjoy tasty, wholesome, and healthy foods such as those described in this book and included in the appendix.

FROM THE AUTHORS

You can follow a diabetes-friendly diet wherever you are, not just at home. Every menu has something on it that's appropriate for you. If you're invited to someone's home, let them know you have diabetes and that the amount of refined and high-glycemic carbohydrates that you can eat is limited. If that fails, limit the amount that you eat. (See Chapter 8 for more on your diet.)

TIP

A person with type 2 diabetes who follows a careful diet can certainly reduce their hemoglobin A1C by a substantial amount. This translates into a significant reduction in the occurrence of complications like eye disease, kidney disease, and nerve disease.

Enthusiastic Exercising

When you take insulin (as opposed to pills), controlling your diabetes is a little harder because you have to coordinate your food intake and the activity of the insulin. There are people who have had diabetes for decades and have little trouble balancing their food and insulin. They're the enthusiastic exercisers. They use exercise to burn glucose in place of insulin. The result is a much narrower range of blood glucose levels than is true of the insulin takers who don't exercise. They also have more leeway in their diet because the exercise makes up for slight excesses.

It doesn't take an hour of running each day or 50 miles on the bike to be healthy. Moderate exercise, like brisk walking, can accomplish the same thing. The key is to exercise faithfully. (For more on exercise, see Chapter 10.) Thirty minutes of moderate exercise every day not only improves your diabetes but also reduces the possibility of a stroke, a heart attack, and many cancers and just keeps you feeling generally good. Exercise can reduce your hemoglobin A1C by 1 percent or more, just like diet can.

Preventive Planning

Having a plan to deal with the unexpected is so important. For example, say that you're invited to someone's home, and they serve something that you know will raise your blood glucose significantly. What do you do? Or perhaps you go out to eat and are given a menu of incredible choices, many of which are just not for you. How do you handle that? Or when you run into great stress at work or at home, do you allow it to throw off your diet, exercise, and compliance with your doctor's orders?

A little advance planning can overcome any eating challenge. Discuss good foods with the people who regularly cook and eat with you. Check out the calorie breakdown of the foods you eat at fast-food places. Many restaurants provide the nutritional breakdown on their websites. Make a diet for yourself and follow it.

TIP

The key to these situations is realizing that not everything will go right all the time. In the case of the friend who cooked the wrong thing for you, you can eat a small portion to limit the damage. At the restaurant, you should come prepared to make the food choices you know will keep you on your diet. It may be better not to look at the menu and simply discuss with your waiter what is available from your list of correct foods.

Major Monitoring

If you've been diagnosed with type 1 diabetes or your treatment for type 2 diabetes requires regular glucose monitoring, you'll no doubt have acquired a new incredibly compact and accurate glucose meter. Now you want to use it to find out how your blood glucose is doing at any time of day or night under any circumstances. You don't feel well. Is it low blood glucose or the beginning of a cold? Test! You just ate an imbalanced meal or too much starch or sugar. Did it raise your blood glucose too much? Test! You can monitor your glucose in so many almost painless ways that there's no reason not to do it. And you don't have to do it with a finger stick every time. (Refer to Chapter 7 for more info on monitoring.)

Even the most basic meters allow you to draw blood from other parts of your body — your arm, leg, or abdomen, for example — especially when the blood glucose wouldn't be expected to change rapidly as it would during or after exercise or after a meal. At those times, you should use only your finger. It's also worthwhile to see whether your physician can prescribe a continuous glucose monitor (CGM), which uses interstitial fluids instead of blood to measure blood glucose, so that you don't have to prick yourself at all and can check your blood glucose as often as you like.

TIP

People with type 1 diabetes need to test at least before meals and at bedtime because their blood glucose level determines their dose of insulin. People who have stable type 2 diabetes may test once a day at different times or twice a day. If you're sick or about to start a long drive, you may want to test more often because you don't want to become hypoglycemic — or hyperglycemic for that matter. The beauty of the meter is that you can check your blood glucose in less than ten seconds any time you feel it's necessary.

Tenacious Testing

The people who make smoke detectors recommend that you change the battery without fail each time you have a birthday. You should use the same simple technique to remember your "complication detectors." Make sure that your doctor checks your urine for tiny amounts of protein and your feet for loss of sensation every year around the time of your birthday. It takes five to ten years to develop complications of diabetes. When you know the problem is present, you can do a lot to slow it down or even reverse it. Never has it been truer that "an ounce of prevention is worth a pound of cure." (For more on complications that may develop, see Chapter 5.)

Meticulous Medicating

Compliance, which means treating your disease in accordance with your doctor's instructions, is a term that has special relevance for the person with a chronic disease like diabetes who must take medications day in and day out. Sure, it's a pain (even if you could take insulin by mouth and not by injection), but the basic assumption is that you're taking your medication. Your doctor bases all their decisions on that assumption. Some very serious mistakes can be made if that assumption is false.

Check with your pharmacist to make sure that your pills don't interfere with one another or have drug-nutrient interactions. Some pills are taken with food; others are taken with no food for a period before and after that medication. Taking them correctly is just as important as taking them at all.

TIP

Every time a study is done on why patients' health conditions don't improve, compliance is high up or leads the list of reasons. Do you make a conscious decision to skip your pills, or do you forget? Whatever the reason, the best thing to do is to set up a system so that you're forced to remember. Keeping your pills in a dated container quickly shows you whether you've taken them. You can even divide the pills by time of day.

Fastidious Foot Care

Keeping your glucose in check ensures that you don't develop neuropathy, which prevents you from feeling your feet. You can easily know when this problem exists just by checking your feet with a 10-gram filament. If your feet can't feel the filament, they won't feel burning hot water, a stone under your foot, a nail in your shoe, or an infected ulcer of your foot.

When you lose sensation in your feet, your eyes must replace the pain fibers that would otherwise tell you there's a problem. You need to carefully examine your feet every day, keep your toenails trimmed, and wear comfortable shoes. Your doctor should inspect your feet at every visit.

Diabetes is the primary cause of foot amputations, but this drastic situation is entirely preventable if you pay attention to your feet. Test bath water by hand, shake your shoes out before you put them on, wear new shoes only a short while before checking for pressure spots, and get a 10-gram filament and see whether you can feel it. If you smoke, you're especially at a high risk for an amputation of your toes or foot. The future of your feet is in your hands.

The other aspect of fastidious foot care is making sure the circulation in the blood vessels of your feet remains open. Doctors perform an ankle-brachial index on all patients with diabetes older than age 50 and younger patients who have risk factors for arterial disease, such as smoking and high blood pressure (see Chapter 5). This test quickly tells you and your doctor whether you're experiencing a problem with your circulation.

Essential Eye Care

Caring for your eyes starts with a careful examination by an ophthalmologist or optometrist. You need to have an exam at least once every two years (or more often if necessary). If you have controlled your diabetes meticulously, the doctor will find two normal eyes. If not, signs of diabetic eye disease may show up (see Chapter 5). At that point, you need to control your diabetes, which means controlling your blood glucose. You also want to control your blood pressure because high blood pressure contributes to worsening eye disease, as does high cholesterol.

Lifelong Learning

So much is going on with diabetes that it can be difficult to keep up with new discoveries and changes.

We're passionate to teach people about diabetes because we believe that through increased understanding, those who suffer from the illness will gain control of their health and situation. Using this book and online resources will empower you to make meaningful choices to improve your health and lifestyle. This book will help you to fully understand diabetes for the first time, to be less fearful of it, and use knowledge to benefit yourself. The path to optimal health should be a lifelong journey for everyone, not only those suffering from an illness.

Find a diabetes education program in your area to stay abreast of advancements.

WARNING

There's more information than ever available due to social media and the internet. In your quest for knowledge, be sure to seek out solutions from people and resources that are truly beneficial. Remember that a lot of misinformation is available on the web, so you must be careful to check out a recommendation before you start to follow it. Even information on reliable sites may not be right for your particular problem.

May your learning enable you to live your best life.

IN THIS CHAPTER

- Separating diabetes fact from fiction
- Being wise about your medical care

Chapter 19
Ten Myths about Diabetes That You Can Forget

The trouble with myths is that some myths can hurt you if you allow them to determine your medical care or to limit your ability to take control of your health. This chapter is about those kinds of myths — the ones that lead you to fail to take your medication or stay on your diet, or even lead you to take things that may not be good for you.

Perfect Treatment Yields Perfect Glucoses

Doctors are probably as responsible as their patients are for the myth that perfect treatment results in perfect glucose levels. For decades, doctors measured the urine glucose and told their patients that if they would just stay on their diet, take their medication, and get their exercise, the urine would be negative for glucose. Doctors failed to account for the many variables that could result in a positive test for glucose in the urine, plus the fact that even if the urine was negative, the patient could still be suffering diabetic damage. (The urine becomes negative at a blood glucose of 180 mg/dl [10 mmol/L] in most people, a level that still causes damage.)

The same thing is true for the blood glucose. Although you can achieve normal blood glucose levels most of the time if you treat your diabetes properly, you can still have times when, for no apparent reason, the glucose isn't normal. So many factors determine the blood glucose level at any given time that this should hardly be a surprise.

Type 2 Diabetes Occurs in All Overweight People and Not in Normal Weight People

Type 2 diabetes has a strong genetic influence, yet people with healthful lifestyle practices are often able to deter their genetic predispositions. If you have a parent or sibling with diabetes, you're more likely to develop it if you don't take the appropriate diet, exercise, and mental practices needed to avoid it. Obesity is a major risk factor for diabetes, but not everyone who is obese develops diabetes, and just because you're slim doesn't mean that you won't develop type 2 diabetes.

A look at the statistics makes this point clearly. More than 200 million overweight adults older than 20 live in the United States of whom more than 100 million are obese (a BMI greater than 30). Yet the total number of adults with diabetes is just 30 million. Ninety million Americans have prediabetes. A study in the *Journal of the American Medical Association* in August 2012 showed that about 12 percent of newly diagnosed people with type 2 diabetes were normal in weight at the time of diagnosis. In 2017, the National Diabetes Statistic Report released by the CDC in the United States confirmed the figure that 87.5 percent of people with type 2 diabetes were overweight. The small but significant proportion who were not overweight has apparently remained consistent. Furthermore, those who were normal in weight had a higher morbidity rate (tended to die) earlier than those individuals who were obese. Note: Don't take this as a recommendation to become obese. Obesity has plenty of other risks associated with it.

You Can't Enjoy Your Food

We hope you won't become a victim of this myth after reading this book. We provide delicious and nutritious recipes that clearly deserve the designation "gourmet" throughout the appendix. If you want more info on the great food you can enjoy, see the latest edition of *Quick Diabetic Recipes For Dummies* (John Wiley & Sons, Inc.). Chapter 8 discusses that no food is forbidden to the person with diabetes. The key is moderation and not allowing yourself to gain too much weight.

Diabetes isn't caused by sugar or fat or any other specific food. Type 2 diabetes typically occurs when the total food consumption leads to weight gain (weight gain isn't always present) in a person who is genetically inclined to develop diabetes. Even then, regular exercise may postpone or prevent diabetes. Eating together is one of the most common social events, and by using the information in Chapters 8, 9, and 10, you can continue to enjoy food despite diabetes. In fact, you may begin enjoying it even more as you begin to focus on your diet and nourishing yourself properly.

You Can Tell the Level of Your Blood Glucose by How You Feel

Many patients have claimed that they can tell their blood glucose level by how they feel, and with the exception of significant hypoglycemia, that isn't true. Sure, if your blood glucose is below 50 mg/dl and you're sweaty and have palpitations and a headache, you know that you're low — but even then, you don't know how low. Therefore, you don't know how much treatment to give yourself to bring it back up but not too high. Regular monitoring is the best way to track glucose before it affects the way you feel.

WARNING

Patients with high blood glucose rarely can tell within 50 mg/dl what their level is. Less than half of patients who guess come close to the correct answer. People who don't test but who instead rely on the way they feel will suffer one or several of the short-term and long-term complications described in Chapters 4, 5, and 6.

People with Diabetes Get More Colds and Other Illnesses

One problem that people with diabetes don't have is a tendency to develop colds and other minor illnesses. A number of risk factors for the development of colds include some of the following:

- Being a child, especially if your parent(s) smokes
- Being exposed to secondhand smoke as an adult
- Taking medication that suppresses the immune system

People with type 2 diabetes do develop high blood pressure and high cholesterol more often. A number of other diseases, including some cancers, arthritis, and bone fractures, are more common in diabetics. Refer to Chapter 5 for more about this topic.

If You Need Insulin, You're Doomed

Many people with type 2 diabetes believe that once they have to take insulin, they're on a rapid downhill course to death. This is not so. If you're using insulin, it probably means that your pancreas has pooped out and can't produce enough insulin to control your blood glucose, even when stimulated by oral drugs. But taking insulin is no more a death sentence for you than it is for the person with type 1 diabetes.

Some people believe that insulin itself causes complications like impotence or other damage. No evidence supports this theory. One study suggested that using insulin to lower the blood glucose so the hemoglobin A1C was less than 6 percent caused more deaths than lowering it to a more modest level like 7 percent.

REMEMBER

This study examined patients who had already had a heart attack and were quite sick when the study began. Even so, the doctors couldn't get the patients' hemoglobin A1C to the level they wanted with insulin. The goal was set too low. It doesn't take lowering to 6 percent to prevent complications in new patients with diabetes; 6.5 percent will accomplish this. First of all, using insulin is often a temporary measure for when you're very sick with some other illness that makes your oral drugs ineffective. When the illness is over, your insulin needs end.

Secondly, you may be on insulin because oral agents you tried failed to control your glucose. Many people in this situation can be taken off the insulin and given one of the newer oral agents, which actually control their glucose better than the insulin.

Elderly people with diabetes may need insulin to keep their blood glucose at a reasonable level but don't need very tight control because their probable life span is shorter than the time it takes to develop complications. Their treatment can be kept very simple. The insulin is being used to keep them out of immediate trouble, not to prevent complications.

Finally, people with type 2 diabetes who truly need to be on insulin intensively need to check their blood glucose more often and live more like a person with type 1 diabetes. With today's methods, this level of intensive treatment means a much higher quality of life than it used to.

People with Diabetes Shouldn't Exercise

WARNING

If any myth is really damaging to people with diabetes, it's this one: People with diabetes shouldn't exercise. The truth is exactly the opposite. Exercise is a major component of good diabetes management — one that, unfortunately, all too often gets the least time and effort on the part of the patient as well as the individual's care providers.

We're not just talking about aerobic exercise where your heart is beating faster. Some form of muscle strengthening needs to be a part of your lifestyle. (See Chapter 10 to find out the benefits of muscle strengthening.) If you have a muscle that you can move, move it!

You Can't Give Blood Because You Have Diabetes

Having diabetes doesn't preclude giving blood. However, the person with diabetes must fulfill the following criteria:

- Your blood glucose should be under control.
- You should be in good health.
- Your blood pressure should be under 180/100.
- You shouldn't be anemic.

If you're going to give blood, make sure you have a good meal without fatty foods before the donation and drink extra fluids to make up for the blood loss. Eat some extra fish, raisins, and spinach to replenish your iron.

If You're Sick and Can't Eat, You Can Skip Your Diabetes Medications

When you get sick, you make more of the hormones that tend to raise the blood glucose. So even though you don't feel like eating, you probably need to take your medications, and maybe even more than usual, particularly if you're on insulin.

How can you know what to do? Test your blood glucose! That handy meter will help you decide if things are okay, if your control is a little off, or if you need to contact your doctor for advice. Even if you don't do much testing because your blood glucose is generally so good, you may want to test every four to six hours during illness if you find that your glucose is high, low, or unstable.

Diabetes Is Shameful

This final myth is perhaps the most detrimental of all. There's a severe stigma attached to diabetes in our modern world. Because type 2 diabetes is often found in those who are overweight, it assumes that the patient is at fault for having the disease. Diabetes is a sensitive and often taboo subject in social circles. Many of those with the diagnosis shy away from discussing it in public for fear that they'll be ridiculed for their weight or for not taking better care of themselves. Although we don't believe that diabetes itself is shameful, the idea of shaming those who suffer from it is.

To a certain extent, most modern illnesses are somehow related to diet and lifestyle, but this doesn't mean that a patient is at fault. For example, when someone has been diagnosed with a tumor, has a stroke, develops a serious allergy, or suffers a heart attack, most of their loved ones and peers feel empathetic. When someone is diagnosed with diabetes, however, others tend to point fingers at them and offer emotionally damaging and often incorrect advice.

The truth of the matter is that most human beings will suffer from various sicknesses or diseases in their lives. Our magnificent bodies are in constant contact with our minds, and feeling bad or developing an illness is a way for them to get our attention. If you're someone who has been diagnosed with diabetes, don't fall into the trap of blaming yourself any more than you would for any other medical condition. Use the diagnosis, instead, to empower yourself to listen more carefully to your body's cues and to give it the attention that it deserves. Choose who you share your diagnosis with carefully and ask for their support while explaining that scolding won't inspire you to stay on the right path.

Those who don't have diabetes should refrain from preaching when someone confides in you. If you care about them, tell them that you empathize with them and are willing to do what it takes to help them achieve their health goals. Treat them the way you would like to be treated if you were in their place. As a society, we should work on shifting the stigma into one of care and concern. This one small change alone could help to decrease the epidemic levels of diabetes diagnosis that we now face.

Appendix

Mini-Cookbook

In this appendix, we share 25 simple, easy, delicious, and nutritious recipes that everyone can appreciate. Each recipe is quite flexible and you can alter it to accommodate seasonal produce, what you have on hand, and personal preferences. They all contain low-glycemic-index foods and are also beneficial for those following heart-healthy and anti-inflammatory diets. Diabetes-friendly nutrients, polyphenols, antioxidants, probiotics, and prebiotics are plentiful in the recipes included in this appendix.

Because space is limited in this section, we included a selection of breakfast, lunch, dinner, and snack options that provide the most flavor and nutritional "bang for your buck" possible. In addition to Amy's signature Mediterranean dishes, we've also included Asian-, Latin-, African-, and American-style recipes to satisfy all tastes and encourage home cooking as often as possible.

For more diabetes-friendly recipes, check out *Diabetes Recipes For Dummies* (John Wiley & Sons, Inc.) as well as the *Mediterranean Diabetes Cookbook* and the *Italian Diabetes Cookbook* (American Diabetes Association). An internet search of "Amy Riolo" and the word "diabetes" will return scores of recipes, articles, videos, and resources.

Understanding Culinary Medicine

Culinary medicine is a term used to describe combining the preparation and enjoyment of food with the science and knowledge of medicine for the purpose of improving health. Unfortunately, most chefs receive very little training in nutrition, and doctors receive even less, despite increasing evidence that most chronic diseases can be prevented through lifestyle measures, of which dietary habits are perhaps the most important. You may leave your doctor's office with a prescription for a medicine — the benefit of which is modest and the side effects of which are potentially significant — yet you may have received no advice that dietary changes can have more powerful and exclusively positive effects.

Although the concept of culinary medicine has been defined only in the last few years, it's by no means a new idea. The ancient Egyptians were masters of culinary medicine. In fact, 67 percent of the material found in ancient Egyptian medical texts was found to be true by the British Pharmaceutical Codex in the 1970s. Hippocrates, the Ancient Greek "father of medicine," often prescribed combinations of herbs and other ingredients that were more like recipes than medicines. Historians describe the work of Marcus Gaius Apicius, who lived under the rule of the Roman emperor Tiberius and was perhaps the first "foodie writer and celebrity chef." He is thought to have written numerous recipes, many of which were promoted for their healing effects based on an understanding of the practice of contemporary physicians. Nowadays, Apicius is considered the "father of gourmands" with more restaurants and cooking schools named after him than anyone else.

Authors Amy and Simon first met at the Harvard Club in New York and immediately found a shared passion for culinary medicine and the health benefits of good food. After speaking at a club event, Simon became Amy's sous chef for the afternoon in a spontaneous performance that brought together the excitement of the food preparation with talk of the special flavors of the Mediterranean herbs and spices alongside their antioxidant and anti-inflammatory health-giving properties.

Today, Amy and Simon continue to collaborate, advocating positive nutrition and the celebration of that combined experience to cocreate their recipe and prescription for wellness. Each recipe in this appendix combines this expertise. The recipes are crafted not only for their beautiful flavor and your enjoyment but also to confer, without you even knowing it, very real and tangible health benefits.

As we discuss throughout the book, the delicious meals you enjoy today can create wellness. With a focus on the low-glycemic-index rating of particular foods and the low-glycemic load when put together in the recipe, the effect will be to maintain stable and optimum control of blood sugar. The good monounsaturated and polyunsaturated fats support ideal cholesterol profiles; high-quality and lean

proteins are often from plants, which provide fiber, vitamins, minerals, and polyphenols; and the delicious flavors of these traditional recipes owe much to the antioxidant and anti-inflammatory bioactive compounds in the ingredients. We're learning that a diverse and rich population of friendly gut bacteria is important for health, and the ingredients in the recipes help support microbiome.

These recipes combine great diabetes control with the ability to reduce inflammation and protect from the illnesses that may be the consequences of diabetes.

Getting to Know Amy Riolo's Culinary Philosophy

I never set out to write diabetes recipes or books. Although my love of cooking, baking, and nourishing others started at a very young age — 3, to be exact — at that time, I helped my grandmothers prepare decadent Italian and Greek holiday treats and celebratory breads without worrying about the amount of nutrients that a dish had to offer. When I was 15, my mom began working outside of the home and decided that I should be responsible for getting the family's dinner on the table each night. In those days, I'd have rather been at the shopping mall with my friends than being burdened with that "chore," but I decided that if I was going to have to cook, I may as well try to make it as fun as possible. I began to love the challenge of coming up with something beautiful and tasty with whatever few ingredients my mother left out for me. Transforming those ingredients into the best expression of themselves became my goal — and a few decades later, it became my career.

Something changed when my mother was diagnosed with type 2 diabetes only a few months after I took over preparing the family's meals. It was an experience I've never forgotten. She came home from her doctor's office with a prescription paper that listed all the foods she could no longer eat. It included things like eggplant parmesan, pasta, and Chinese food. Even though I was just a kid and knew very little about nutrition, I was furious. It was wrong of the doctor to tell my mom that she could no longer eat a lot of her favorite foods. It was even more inaccurate to list foods that have the potential to be healthful on her "forbidden" list. Worse yet, she wasn't given any advice on what to do, or what she should eat, only what she could no longer enjoy.

We mourned for about three days, grieving the loss of our beloved family recipes and favorite go-to foods when we ate out. I had no idea what to make for dinner anymore. This was before the days of the internet and good, health-conscious cookbooks that featured recipes that tasted great and were good for you.

Inspiration was scarce, but all of a sudden, I had a light-bulb moment! I realized that if I made a list of all the foods that my mom could and should eat, I could make dinners from them. I created the list and divided the foods into types (grains, beans and legumes, fruits and vegetables, protein, dairy, and so on). I then transformed our family's favorite Italian dishes using those ingredients or simply created the intrinsically healthful ones. I came up with some new creations, and even revamped our restaurant and takeout favorites (Chinese, Mexican, and American classics) into ones that fit into my mother's diabetes-friendly dietary requirements.

My other requirement for our family dishes were that they were satisfying, tasty, and appealed to the whole family because I didn't want to have to cook twice. I made a little cookbook of recipes for my mom to take back to her doctor for his approval. He read the typed pages and said, "These are great! Is your daughter a dietician?" And my mom replied; "No, she's only 15!"

I share this story for several reasons. First, if I could cook healthful and mouthwatering food for my family at 15, most anyone can. So hopefully, it will inspire anyone desiring to eat better and enjoy cooking more to do the same. Second, I know firsthand the importance of saving time, working with limited ingredients, and operating within dietary restrictions. By focusing on the foods that you and your loved ones *can* eat, you'll always succeed. Last, I enjoy retelling the story because it reminds me of each individual's personal power to transform seemingly negative situations into positive ones and the hidden benefits of doing so.

Back in the day, I just wanted my mom to be happy and healthy. I wanted my family to enjoy our meals, and I hoped to be able to enjoy myself in the process of nourishing them. I never expected that one day I'd be cowriting a book like this or have published 11 award-winning and bestselling other books (three of them with a diabetes focus) as an adult. I've created thousands of diabetes-friendly recipes in my career and have worked for The American Diabetes Association, The US Endocrine Society, and dozens of food companies, and I'm a Brand Ambassador for the Maryland University of Integrative Health.

I've been nominated an Ambassador of the Mediterranean Diet, Mediterranean Cuisine in the World, and Italian Cuisine in the United States. A Cairo-based newspaper once called me "The Cook to the Kings" because I've cooked for world leaders. CNN.com once asked me to create a menu proposal for Prince William's wedding. I've taught classes and appeared on TV throughout the United States, Mediterranean, and Middle East. Regardless of the venue or who I'm cooking for, however, my mission is always to create the best-tasting and most nutritious recipes with the ingredients I have on hand. I want my food to be meaningful to those who eat it, which is why I'm always happy to alter recipes and add ingredients that can boost health and flavor.

Getting the Most out of This Section

The recipes in this book aren't worth the effort of writing them if you don't enjoy them. There's an Italian saying *Il cibo gradito é meglio digerito,* which means "The food that is enjoyed is digested better." The last thing that you want to do when you're suffering from any kid of discomfort is eat something that you don't like. Our suggestion is always to start incorporating more of the healthful foods that you most enjoy, and, perhaps try a new nutrient-dense food once a week. Trying to do too much too soon is an easy way to set yourself up for failure. Swapping out one negative food choice for a positive one per day or week can have many benefits over time.

Catchphrases such as "eat the rainbow" and "everything in moderation" are great to remember when planning meals because a rainbow of richly colored produce will provide you with a wide range of vitamins, minerals, and antioxidants needed to keep your body happy. Adopting the "everything in moderation" motto allows you to enjoy food without overdoing it and prevents anything from being completely "off limits." The mentality of elimination and cutting out certain foods completely can help people achieve quick weight loss or other goals, but it's also hard to maintain. Many people swear off certain foods only to "fall off the wagon" later on. The 90-10 rule, which means that you eat "good-for-you-foods" 90 percent of the time and indulge in the less smart choices only 10 percent of the time, is a good guideline. An occasional slice of birthday cake is fine as long as the majority of your diet is made up of healthful nutrients.

We strongly recommend reading Chapters 8, 9, and 10 before selecting recipes in this appendix and beginning to cook. We offer proven strategies for prepping ingredients that will enable you to make these recipes, as well as many others, in just a few minutes. The information will also help you repurpose leftovers to save time and money while eating better. We reveal our favorite tips for making smoothies, soups, salads and bowls, skillet dishes, spreads, sandwiches, and sauces with ease and flair.

Eating Well Made Easy

When Amy taught a "Culinary Medicine Made Easy" cooking class series, she used to hold a class each week dedicated to different types of foods that helped with specific health goals. One class was dedicated to brain wellness; others were on diabetes-friendly foods, heart-healthy recipes, beauty foods, antioxidants, and more. The biggest takeaway for students at the end of the series was that there

was so much overlap of ingredients. Foods that are diabetes-friendly, for example, are also good for heart health, skin, and brain functionality. By simply enjoying these recipes, and others made in a similar fashion, you'll be improving your overall wellness while balancing your blood sugar levels and reducing your risks of complications later on.

REMEMBER

Skip the sugar-laden and the "diet" and "sugar-free" packaged drinks, and choose clean, pure water to accompany your meals as often as possible. Add lemon slices, which can have an alkalizing effect on the body, if desired. Green tea with mint and tisanes made from herbs and spices such as pure cinnamon can help prevent blood sugar from spiking. Tisanes made from ginger, cinnamon, and turmeric have great anti-inflammatory properties that can be beneficial to those suffering from any illness. A serving of drinkable yogurt, such as kefir, can help increase your intake of probiotics daily. For coffee lovers, Greek- and Turkish-style coffee are rich in polyphenols and other compounds that make a few small cups a day a good choice for overall health. If you're a wine lover, you can also enjoy one serving of polyphenol-rich red wine with a meal daily.

Cooking Some Healthful Recipes

Throughout the book, we emphasize that it's possible to enjoy your food and still keep your diabetes under control while enjoying yourself in the process. The following recipes make this possible, while providing meal options that you can share with your loved ones. Again, if you prep your ingredients as explained in Chapter 10, you'll cut down on cook time and waste considerably. If you prep accordingly, you should be able to enjoy these meals in less time than it takes to wait for food to be delivered or to drive to a restaurant and wait to be served. Best of all, you get to enjoy the process of creating the food and reap the benefits of enjoying the best-quality ingredients. Be sure to read the tips and notes at the end of each recipe for more information and serving suggestions.

You may want to adjust the recipes to suit your taste, and you should certainly make modifications if you have any allergies or intolerances. Some recipes include a little salt, but you can reduce it according to taste and if you have issues with blood pressure that may be affected by added salt.

Each recipe includes the nutritional profile. This can be helpful but is limited. For example, cholesterol in diet is now considered to be less important than previously thought. Total fat content doesn't reflect the proportion of healthy and less healthy fats, and we don't specifically recommend a low-fat approach to diet. Similarly, saturated fats have different proportions of component fatty acids that

may have a different effect on health. Calories are also an area of debate. We advocate focusing on the quality of the food and portion size rather than on strict calorie counting.

TIP

Through this appendix, the vegetarian recipes.

Basics

This section provides base recipes for commonly used ingredients such as cooking beans and legumes, making tomato sauce, and making your own bread crumbs. While preparing those items may sound basic, or like a waste of time, they're actually the backbone of the kitchen. Making your own, instead of purchasing them ready-made, ensures that you don't get added fillers or chemicals into the mix, while saving money and preserving flavor.

Dried Beans or Chickpeas

PREP TIME: 1 HR OR UP TO OVERNIGHT	COOK TIME: 25–50 MIN	YIELD: 4 (½ CUP) SERVINGS COOKED BEANS

INGREDIENTS

1 cup dried beans (any variety)

¼ teaspoon sea salt

1 bay leaf

½ teaspoon baking soda

DIRECTIONS

1. Soak beans overnight in cold water, or cover in boiling water for 1 hour prior to cooking.
2. To prepare, drain the soaked beans and place them in a saucepan. Add the salt, bay leaf, and baking soda, cover the beans with water, and bring to a boil over high heat.
3. Reduce the heat to medium-low, cover, and cook until the beans are tender, about 25 to 50 minutes. (This may take longer depending on the size of the beans.)
4. Drain, rinse well, remove the bay leaf, and cool. If not using right away, store the drained beans in an airtight container in the refrigerator for up to 1 week.

PER SERVING: *Calories 110 (From Fat 3); Fat 0g (Saturated 0g); Cholesterol 0mg; Sodium 52mg; Carbohydrate 20g (Dietary Fiber 6g); Protein 8g.*

Homemade Vegetable Stock

PREP TIME: 5 MIN	COOK TIME: 30 MIN	YIELD: 14 CUPS

INGREDIENTS

1 onion, peeled and halved

1 carrot, peeled, trimmed, and halved

1 stalk celery, trimmed and halved (can include leaves, if desired)

¼ pound cherry tomatoes

4 sprigs fresh basil, with stems

1 small bunch fresh flat-leaf parsley, with stems

4 quarts (16 cups) water

½ teaspoon salt

DIRECTIONS

1. In a large stock pot, place the onion, carrot, celery, cherry tomatoes, basil, and parsley. Cover with the water. Bring to a boil over high heat then reduce the heat to medium-low. Add salt and simmer, uncovered, for 30 minutes.
2. Drain the stock into a bowl, reserving the liquid. Discard the rest.
3. Allow to cool and store in an airtight container in the refrigerator for up to 1 week or the freezer for up to 1 month.

PER SERVING: *Calories 12 (From Fat 1); Fat 0g (Saturated 0g); Cholesterol 0mg; Sodium 77mg; Carbohydrate 3g (Dietary Fiber 1g); Protein 0g.*

Homemade Chicken (or Meat) Stock

PREP TIME: 5 MIN	COOK TIME: 40 MIN	YIELD: 14 CUPS

INGREDIENTS

1 medium onion, peeled and halved

1 medium carrot, peeled, trimmed, and halved

1 medium stalk celery, trimmed and halved

1¼ pounds chicken bones or carcasses OR

3 pounds beef or lamb bones (shin, leg, rib, or collar), cut into 4-inch pieces

1 teaspoon whole black peppercorns

1 dried bay leaf

4 quarts (16 cups) water

½ teaspoon salt

DIRECTIONS

1. In a large stock pot, place the onion, carrot, celery, bones, peppercorns, and bay leaf. Cover with the water. Bring to a boil over high heat then reduce the heat to medium-low.

2. Skim off the residue that forms on top of the stock and discard. Add the salt and simmer, uncovered, for 40 minutes if using chicken bones or 2 hours if using meat bones. Drain the stock into a bowl, reserving the liquid. Discard the rest.

3. Let cool and store in an airtight container in the refrigerator for up to 1 week or the freezer for up to 1 month.

PER SERVING: *Calories 46 (From Fat 4); Fat 0g (Saturated 0g); Cholesterol 9mg; Sodium 68mg; Carbohydrate 0g (Dietary Fiber 0g); Protein 9g.*

Homemade Croutons/Bread Crumbs

PREP TIME: 5 MIN	COOK TIME: 2–5 MIN	YIELD: 4 (¼ CUP) SERVINGS

INGREDIENTS

4 cups cubed Italian bread or any gluten-free bread

1 tablespoon extra-virgin olive oil

DIRECTIONS

1. Preheat the broiler to high.
2. Cut the bread into 1-inch cubes and place on a baking sheet. Drizzle the olive oil onto the bread cubes and toss to combine.
3. Place under the broiler and toast until golden, 1 to 2 minutes on each side. To make bread crumbs, process the cooled croutons in a food processor until fine.
4. Let cool and store in an airtight container in the pantry for up to 1 week.

PER SERVING: *Calories 111 (From Fat 40); Fat 4g (Saturated 1g); Cholesterol 0mg; Sodium 175mg; Carbohydrate 15g (Dietary Fiber 1g); Protein 3g.*

Salsa di pomodoro/Fresh Tomato Sauce

PREP TIME: 5 MIN	COOK TIME: 20 MIN	YIELD: 6 SERVINGS

INGREDIENTS

2 tablespoons Amy Riolo Selections or other good-quality extra-virgin olive oil

2 large garlic cloves, peeled and minced

1½ pounds strained (seeded and skinned) boxed or jarred tomatoes, such as Pomi brand OR 2½ pounds fresh, ripe tomatoes (if in season)

½ teaspoon sea salt, plus extra to taste

Freshly ground black pepper to taste

4–5 leaves of fresh basil, oregano, or parsley

Parmigiano-Reggiano or Pecorino Romano cheese, freshly grated, for garnish

DIRECTIONS

1. Heat the oil in a medium saucepan over medium heat. Add the garlic, and reduce the heat to low.
2. When the garlic begins to release its aroma (before it turns color), add the tomatoes.
3. Stir and allow the mixture to come to a boil to create caramelization on the side of the pan.
4. Add the salt, pepper, and fresh herbs; stir and cover. Reduce the heat to low and simmer for 10 to 20 minutes, or until it has thickened slightly. Taste and adjust the seasoning.

PER SERVING: *Calories 75 (From Fat 44); Fat 5g (Saturated 1g); Cholesterol 0mg; Sodium 166mg; Carbohydrate 8g (Dietary Fiber 2g); Protein 2g.*

Breakfast

Amy finds that breakfast recipes are always the most challenging to write. It's not that they're difficult per se, but people have very different ideas of what constitutes a proper breakfast. People's personal breakfast preferences also vary greatly, even within the same cultures. Many people like sweet breakfasts, some like to enjoy big breakfasts leisurely, others like savory breakfast items, and others eat breakfast only if it can be prepared quickly and consumed "on the go." For this reason, the breakfast recipes here fit each of those needs and could also be enjoyed at snack time in smaller quantities, or with a salad and some lean protein for lunch or dinner.

Aphrodite Salad

PREP TIME: 5 MIN	COOK TIME: NONE	YIELD: 2 SERVINGS

INGREDIENTS

1 ripe avocado, halved and pitted (see Figure A-1)

½ cup Greek-style yogurt (organic and sheep or goat milk if possible)

½ cup raspberries, cleaned

¼ cup pomegranate seeds

1 tablespoon flax seeds

1 tablespoon Amy Riolo Selections or other high-quality extra-virgin olive oil

DIRECTIONS

1. Dice the avocado into ¼-inch cubes and place in mounds on the bottom of two plates. You can use a ring mold to create a circular-shaped salad.
2. Dollop ¼ cup of the yogurt over each avocado base. Sprinkle half of the raspberries and pomegranate seeds on top of each.
3. Garnish with the flax seeds and drizzle with the olive oil. Serve immediately.

PER SERVING: *Calories 327 (From Fat 229); Fat 25g (Saturated 4g); Cholesterol 8mg; Sodium 30mg; Carbohydrate 20g (Dietary Fiber 11g); Protein 10g.*

TIP: Try blending the salad for a quick and nutritious breakfast on the go.

NOTE: Amy created this dish after tasting something similar at a raw food restaurant in Rome years ago. Even though it's very nutritious, the colors, textures, flavors, and presentation give it a luxurious feel that we're sure even the goddess of love herself would appreciate.

VARY IT! Swap in your favorite fruits in place of the raspberries and pomegranate seeds.

How to Pit and Peel an Avocado
1. Slice the avocado in half lengthwise and pull apart.
2. Firmly strike the pit with a chef's knife.
3. Lift the pit out with a gentle twist of the knife.
4. GENTLY scoop out the fruit with a spoon.
Chop or slice according to your recipe.

FIGURE A-1: Pitting and extracting the fruit from an avocado.

Cardamom-Scented Almond and Flax Seed Waffles with Blueberry Vanilla Syrup (Gluten-free)

PREP TIME: 5 MIN	COOK TIME: 10 MIN	YIELD: 2 SERVINGS

INGREDIENTS

1 large egg

2 teaspoons pure vanilla extract, divided

¼ cup milk or unsweetened almond milk

1 tablespoon flax seeds

1 cup almond flour

Pinch salt

½ teaspoon baking soda

1 cup blueberries, divided

½ teaspoon ground cardamom

1 tablespoon good-quality raw honey

1 teaspoon unsalted butter, melted, or oil, for waffle maker

DIRECTIONS

1. Plug in the waffle maker (see Tip below).
2. In a medium bowl, whisk together the egg, vanilla, and milk.
3. Stir in the flax seeds, almond flour, salt, and baking soda, mixing well to combine.
4. If the batter seems too thick, add water, a tablespoon at a time, to give the batter a consistency slightly thicker than normal pancake batter.
5. Place ¾ cup of the blueberries, the cardamom, and the honey in a blender or food processor and puree until smooth.
6. Pour the blueberry juice into a small saucepan, bring to a simmer, and remove from the heat.
7. Brush the waffle maker with the melted butter or oil. Pour approximately ⅓ cup of batter onto the hot waffle maker.
8. Using a spoon, spread the batter to the corners before closing the lid.

(continued)

9. Cook until the waffles are puffy and golden, approximately 3 to 5 minutes.

10. Spoon the remaining blueberries and blueberry syrup over the warm waffles and serve immediately.

PER SERVING: *Calories 493 (From Fat 319); Fat 35g (Saturated 5g); Cholesterol 113mg; Sodium 601mg; Carbohydrate 35g (Dietary Fiber 10g); Protein 18g.*

TIP: Waffle makers vary from manufacturer to manufacturer, so test yours out — both to find out exactly how much batter you need to make the proper-size waffle on your iron and to test the amount of time it takes to accurately cook the waffles. Some waffle makers have lights to tell you when the iron is preheated and when the waffles have finished cooking.

NOTE: This recipe makes a nutritious and decadent breakfast that's perfect for weekends and special occasions. Try making extra waffles and freezing them in an airtight container to use at another time.

VARY IT! By swapping out the baking soda in this recipe for baking powder, you can create gluten-free pancakes instead of waffles. Swap the blueberries for another berry to create different types of syrups. You can also top with a bit of your favorite nut butter for additional protein.

Shakshouka (North African–Style Egg, Tomato, and Pepper Skillet)

PREP TIME: 10 MIN	COOK TIME: 20 MIN	YIELD: 4 SERVINGS

INGREDIENTS

2 tablespoons Amy Riolo Selections or other good-quality extra-virgin olive oil

1 tablespoon harissa sauce, or your favorite hot sauce or chili paste (optional)

2 tablespoons tomato paste

1 teaspoon smoked paprika

1 yellow onion, diced

2 large sweet red peppers, trimmed, seeded, and cut into small pieces

2 cups chopped very ripe tomatoes

4 large eggs

½ cup labneh (strained yogurt), or plain Greek yogurt

1 teaspoon za'atar spice mix

DIRECTIONS

1. Heat the olive oil in a large skillet over medium heat.
2. Add the harissa (if desired), tomato paste, paprika, onion, and peppers.
3. Stir well to combine and cook until the peppers are tender, about 5 to 7 minutes.
4. Add the tomatoes, stir, and increase the heat to high. When the mixture begins to boil, reduce the heat to low and simmer until the sauce thickens, about 10 minutes. Taste and adjust the seasoning.
5. Make 4 wells in the sauce. Break the eggs into the wells. Using a fork, gently swirl the egg whites into the sauce.
6. Simmer, uncovered, until the egg whites are set but the egg yolks aren't yet hard, about 6 to 8 minutes. Remove from the heat and allow to set for a few minutes before serving.

(continued)

7 Place four dollops of labneh or yogurt in between the eggs.

8 Sprinkle the za'atar spice mix over the top and serve.

PER SERVING: *Calories 229 (From Fat 116); Fat 13g (Saturated 3g); Cholesterol 215mg; Sodium 253mg; Carbohydrate 18g (Dietary Fiber 4g); Protein 12g.*

TIP: This Mediterranean favorite (each place has its own version) originated in Tunisia but is now very popular in Israel and the United States. Enjoy it for a leisurely breakfast or vegetarian lunch or dinner.

NOTE: Shakshouka is normally served with warm pita bread. Try whole wheat or barley bread for a wholesome and satisfying accompaniment. *Za'atar is* the Arabic word for a particular variety of wild thyme that is often used as a natural medicinal. The spice mix that goes by the same name incorporates coriander, sesame seeds, and sea salt. In the Eastern Mediterranean region, it's used along with olive oil to soothe respiratory ailments and as a general health-boosting ingredient.

VARY IT! Use green tomatoes and/or spinach instead of the tomatoes and green bell peppers instead of red ones to make a "Green Shakshouka," which is very popular in Palestinian and Lebanese kitchens.

Whole-Grain Avocado Toast with Cherry Tomatoes

PREP TIME: 5 MIN	COOK TIME: 2 MIN	YIELD: 4 SERVINGS

INGREDIENTS

- 4 slices good-quality whole wheat, barley, or oat bread
- 4 teaspoons Amy Riolo Selections or other good-quality extra-virgin olive oil, divided
- 2 ripe avocadoes, halved and pitted
- ⅛ teaspoon sea salt or fleur de sel
- 4 teaspoons whole flax seeds
- ½ cup cherry tomatoes, diced
- 1 cup walnut halves

DIRECTIONS

1. Toast the bread in a toaster or under the broiler to desired doneness.
2. Drizzle ½ teaspoon of the olive oil over each piece of bread.
3. Scoop the avocado flesh out of the skin, and place the flesh from half of each avocado on each of the pieces of bread.
4. Drizzle the remaining olive oil (½ teaspoon per piece) over each piece of toast.
5. Sprinkle sea salt and flax seeds over the top.
6. Arrange the tomato pieces on top of the flax seeds.
7. Divide the walnuts among 4 plates and place a piece of avocado toast next to each. Serve warm.

PER SERVING: *Calories 449 (From Fat 337); Fat 37g (Saturated 5g); Cholesterol 0mg; Sodium 200mg; Carbohydrate 25g (Dietary Fiber 11g); Protein 10g.*

TIP: Finding ripe tomatoes in many nontropical climates can be difficult. In supermarkets, they're often all ready at the same time or hard at the time of purchase. If they're hard, leave them at room temperature until ripe. If they're all ripe at time of purchase, peel, pit, and remove the flesh. Mash the flesh with a bit of lemon or lime juice. Mix well and place in an airtight container until ready to use.

NOTE: Avocados are so creamy and decadent that it's sometimes difficult to believe they're good for us. They're full of vitamins, nutrients, and heart-healthy fats, while also being cholesterol-free. It's believed that eating avocado may help those with diabetes lose weight and increase insulin sensitivity while lowering cholesterol.

VARY IT! Use sautéed spinach, kale, collard greens, Swiss chard, or any other green instead of avocado.

Ethiopian Greens with Eggs

PREP TIME: 5 MIN	COOK TIME: 20 MIN	YIELD: 4 SERVINGS

INGREDIENTS

1 pound cleaned and trimmed kale or collard greens

2 tablespoons Amy Riolo Selections or other good-quality extra-virgin olive oil

One 2-inch piece fresh ginger, peeled (see Figure **A-2**), or 1 teaspoon dried ginger

1 large yellow onion, diced

2 red bell peppers, seeded and diced

1 hot chili pepper, seeded and minced (optional)

⅛ teaspoon sea salt

⅛ teaspoon freshly ground black pepper

4 eggs, hard-boiled

DIRECTIONS

1. Cut the greens into large pieces.
2. Heat the oil in a very large, wide skillet over medium-high heat.
3. Grate the peeled fresh ginger into the oil, add the onion, and stir to coat.
4. Reduce the heat to medium and, stirring occasionally, cook the onion for approximately 5 minutes, or until soft and light golden.
5. Add the red bell peppers and chili pepper, stir to combine, and increase the heat to medium-high. Cook for 5 minutes.
6. Add the greens, stir to combine, and cook, stirring occasionally, until the greens have cooked down and are wilted.
7. Season with the salt and pepper. Transfer to a serving platter.
8. Cut the eggs in half lengthwise and place around the greens in a decorative way. Serve warm.

PER SERVING: *Calories 240 (From Fat 115); Fat 13g (Saturated 3g); Cholesterol 212mg; Sodium 187mg; Carbohydrate 23g (Dietary Fiber 5g); Protein 12g.*

TIP: Ethiopians traditionally eat their meals with injera or another home-style bread made from teff flour. If you can get teff flour bread in your area, it's a great addition to your diet. If not, substitute whole wheat pita or the most nutritious whole-grain bread you can find to scoop up these delicious flavors.

NOTE: Amy once prepared this recipe with elementary school children in Washington, D.C., who grew kale and collard greens in their school garden. When they harvested them, they called me (Amy) to prepare a recipe, and this is what we made. Before we cooked together, I showed them a presentation about Ethiopia, and I told them that I liked Ethiopian-style greens because they were full of flavor and the recipe had lots of anti-inflammatory benefits. Once we started cooking, their eyes were watering from the amount of onions we used. I was so worried that they wouldn't like it. Instead, they were so mesmerized by the story and the knowledge that kids in another part of the world enjoyed the same crop that they grew, and they loved it! It has been on their school lunch menu rotation ever since. Hopefully, this recipe will win your friends and family over as much as it did the students.

VARY IT! You can use any kind of green in this recipe — spinach, arugula, or dandelion greens. Make a double or triple batch and fill whole wheat pita pockets or wraps with the leftovers, add a drizzle of tahini sauce, Tzatziki Sauce (see the "Snacks" section), or lemon juice, and you have a nutritious and delicious portable lunch or dinner.

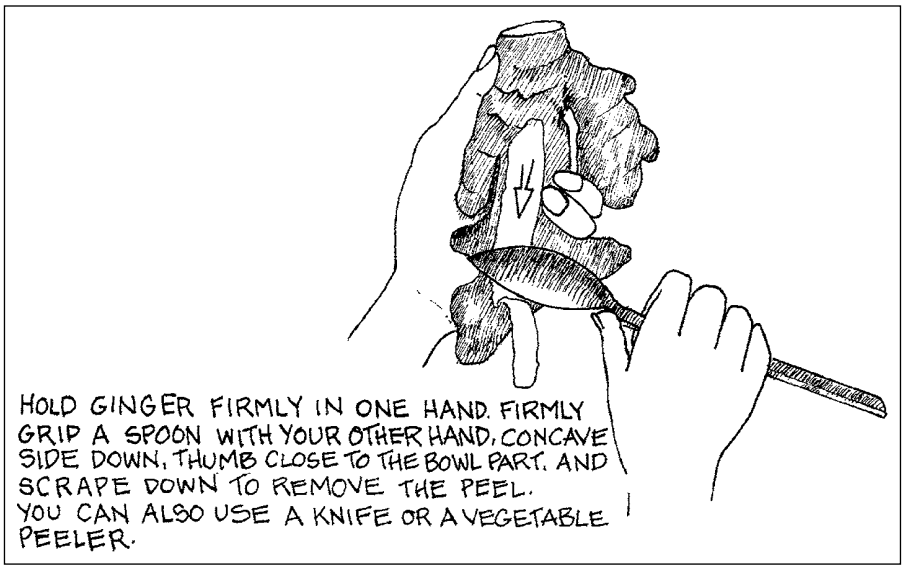
HOLD GINGER FIRMLY IN ONE HAND. FIRMLY GRIP A SPOON WITH YOUR OTHER HAND, CONCAVE SIDE DOWN, THUMB CLOSE TO THE BOWL PART. AND SCRAPE DOWN TO REMOVE THE PEEL. YOU CAN ALSO USE A KNIFE OR A VEGETABLE PEELER.

FIGURE A-2: Peeling fresh ginger.

Beauty Bowls

PREP TIME: 5 MIN	COOK TIME: NONE	YIELD: 2 SERVINGS

INGREDIENTS

1 cup strawberries, cleaned and sliced

½ cup blueberries, cleaned

½ cup kefir or plain (unsweetened) Greek yogurt

2 tablespoons whole or ground flax seeds

2 tablespoons sesame seeds

½ cup whole, unroasted almonds

1 teaspoon raw honey

1 teaspoon ground pure (Ceylon) cinnamon

DIRECTIONS

1. Place half of the strawberries and blueberries in each of 2 bowls.
2. Pour the kefir or spoon the yogurt over the top.
3. Divide the flax seeds, sesame seeds, honey, and almonds over each bowl.
4. Sprinkle the cinnamon over the top of each and serve.

PER SERVING: *Calories 397 (From Fat 243); Fat 27g (Saturated 3g); Cholesterol 8mg; Sodium 25mg; Carbohydrate 28g (Dietary Fiber 10g); Protein 18g.*

TIP: Make this recipe when fresh berries are in season; otherwise, swap out the same quantity for fresh apples or pears.

NOTE: We call these "beauty bowls" because berries are a great way to get more fiber, vitamin C, and healthy cancer-preventing compounds into your diet. The presence of live cultures along with lactic acid, zinc, and other minerals and enzymes in yogurt as well as probiotics in kefir make them a great choice for improving your skin condition as well. Flax seed was cultivated in Babylon as early as 3000 BCE and contains a high amount of omega-3 fatty acids, which can help lower cholesterol and improve the complexion. If you use yogurt in this recipe, you'll get the additional benefit of inulin, a compound that helps balance blood sugar levels naturally.

VARY IT! You can put the same ingredients and a handful of ice in the blender and blend until smooth for a delicious smoothie that also makes great post-workout snacks. Seasonal produce is best, but you can use frozen if you need to.

Moroccan Avocado Smoothies

PREP TIME: 5 MIN	COOK TIME: 5 MIN	YIELD: 2 SERVINGS

INGREDIENTS

1 ripe avocado, peeled and pitted

1 cup cold water

½ cup ice

1 teaspoon pure vanilla extract

½ cup ground almonds (almond meal)

2 soft dates, pitted

DIRECTIONS

1. Place all the ingredients into a blender and blend on high until smooth and creamy.
2. Pour into 2 glasses and serve cold.

PER SERVING: *Calories 364 (From Fat 239); Fat 27g (Saturated 3g); Cholesterol 0mg; Sodium 8mg; Carbohydrate 32g (Dietary Fiber 11g); Protein 7g.*

TIP: Traditionally, you'd use fresh homemade almond milk in this recipe instead of the water, ice, and ground almonds. It can be difficult to find natural almond milks without a lot of sweeteners and additives; however, if you have a clean source of almond milk, you can use 1 cup of that instead of the water and ground almonds.

NOTE: Morocco is full of fresh juice stands. Each seasonal fruit is pressed into delicious, no-added-sugar drinks on demand. Some people like to mix orange juice with the avocado as well.

VARY IT! You can use any fresh fruit — bananas, pomegranate seeds, berries, apples, oranges, or a combination. Be sure to choose those like cherries, grapefruit, and apples that have a lower glycemic index for best results.

Lunch

In terms of health, lunch should be your biggest meal (in calories and amount of food) of the day. You burn more calories and fat during the day while you're active, so eating a larger meal at lunch makes sense. In modern society, however, many people find themselves behind a desk or behind the wheel of a car in the middle of the day instead of moving their bodies as they work. In addition, it's hard to enjoy the biggest meal of the day if you have only a short time to eat it in and aren't at home. You can prepare any of the recipes in the lunch and dinner sections in advance and reheat them for a workplace lunch. Grabbing fast food, eating a small sandwich or salad, and skipping lunch are *not* good options, especially for someone with diabetes. Instead, try to enjoy dishes like those featured in this appendix. Eat with others, if possible, and dedicate some time to listen to something pleasant while savoring some nutritious food daily. Giving thanks for your food, chewing slowly, breathing deeply, and thinking positive thoughts all help you get more out of your meal.

Chicken Souvlaki Bowls

PREP TIME: 10 MIN	COOK TIME: 15 MIN PLUS MARINATING TIME	YIELD: 2 SERVINGS

INGREDIENTS

Two 4-ounce chicken breasts, each cut into 4 pieces (or 2 servings leftover grilled or rotisserie chicken)

¼ cup quality extra-virgin olive oil

Zest and juice of 1 lemon, divided

¼ cup chopped fresh flat-leaf parsley

¼ cup chopped fresh oregano or fresh mint, or 1 teaspoon dried oregano, crushed to release its aroma

⅛ teaspoon sea salt

¼ teaspoon freshly ground black pepper

½ cup Tzatziki Sauce (see "**Snacks**" section for recipe)

1 green bell pepper, seeded and cut into strips

½ cup cherry tomatoes, or diced fresh tomatoes

1 cucumber, diced

¼ cup plain feta cheese, crumbled (optional)

DIRECTIONS

1. Place the chicken, olive oil, half of the lemon zest and juice, parsley, and oregano in a large, shallow dish.
2. Season with the salt and pepper, mix to combine, cover with plastic wrap or a lid, and marinate for an hour or up to overnight in the refrigerator.
3. Using two wide bowls, scoop ¼ cup of the Tzatziki Sauce in the middle of each and arrange the pepper, tomatoes, and cucumber in separate mounds around the sauce, leaving an empty space for the chicken.
4. Cook the chicken by preheating the grill or a grill pan to medium-high.
5. Using tongs, place the chicken on the grill, and cook for approximately 3 to 4 minutes per side, turning about every minute, until the chicken is cooked through and a meat thermometer inserted in the center registers 165 degrees.
6. Drizzle the reserved lemon zest and juice over the top and place in the bowls next to the other ingredients.
7. Crumble the feta cheese over the top (if desired) and serve immediately.

PER SERVING: *Calories 435 (From Fat 315); Fat 35g (Saturated 9g); Cholesterol 38mg; Sodium 553mg; Carbohydrate 20g (Dietary Fiber 3g); Protein 13g.*

TIP: Save time making this salad by having the vegetables and the Tzatziki Sauce prepped and stored in the fridge in advance.

NOTE: Any leftover protein — salmon, shrimp, beef, lamb, or goat — would work well in this recipe.

VARY IT! You can serve the same mixture in whole wheat pita wraps or lavash. Make this recipe vegan by replacing the chicken with portabella mushrooms or tofu. Make it vegetarian by swapping out the chicken for a slice of Halloumi cheese.

Sweet Potato, Spinach, Barley, and Lentil Salad with Cashews and Citrus Honey Dressing

PREP TIME: 20 MIN	COOK TIME: 15 MIN	YIELD: 2 SERVINGS

INGREDIENTS

- 1 sweet potato
- ½ cup barley, millet, or quinoa
- ½ cup red, brown, or green lentils
- 1 pound fresh baby spinach, kale, dandelion greens, or arugula
- ¼ cup unsalted cashews or almonds
- ¼ cup Amy Riolo Selections or other good-quality extra-virgin olive oil
- Zest and juice of 1 orange
- Zest and juice of 1 lemon
- 1 teaspoon raw honey
- ⅛ teaspoon sea salt
- ¼ teaspoon freshly ground black pepper

DIRECTIONS

1. To cook the sweet potato, roast it in the oven at 425 degrees for 30 minutes or until tender.
2. Fill two medium saucepans three-fourths full of water and bring to a boil over high heat.
3. Add the barley to one pan and the lentils to the other. Stir, and reduce the heat to medium-low. Cook until tender (approximately 15 minutes for the barley and 5 minutes for the lentils). Drain and let cool slightly.
4. Place the spinach at the bottom of 2 bowls.
5. Chop the sweet potato into large chunks and place on top of the spinach.
6. Layer the cooled barley and lentils over each. Sprinkle the cashews over the top.
7. In a medium bowl, whisk together the olive oil, orange and lemon juices, honey, salt, and pepper until creamy and emulsified.
8. When it's time to serve the salad, drizzle the vinaigrette over the top and garnish each with orange and lemon zest.

PER SERVING: *Calories 793 (From Fat 332); Fat 37g (Saturated 5g); Cholesterol 0mg; Sodium 386mg; Carbohydrate 97g (Dietary Fiber 21g); Protein 28g.*

TIP: If you have prepared lentils and barley in advance, as we describe in Chapter 10, this salad is a cinch to prepare. Store the vinaigrette separately until serving.

NOTE: You can use any combination of greens, grains, and legumes in this salad.

VARY IT! If you have leftover proteins, you can add them to this salad as well. You can also make a delicious soup out of the same ingredients or leftover salad. Just sauté a diced onion in extra-virgin olive oil until translucent, add the sweet potato, barley, lentils, salt, and pepper. Add water or homemade vegetable stock to almost cover the other ingredients and bring to a boil. Reduce heat and simmer until everything is tender.

Homemade Italian Minestrone with Mixed Greens and Balsamic Dressing

PREP TIME: 15 MIN	COOK TIME: 30 MIN	YIELD: 2 SERVINGS

INGREDIENTS

¼ cup plus 1 tablespoon Amy Riolo Selections or other good-quality extra-virgin olive oil, divided

1 medium yellow onion, finely chopped

2 carrots, finely chopped

1 celery stalk, finely chopped

¼ cup flat-leaf parsley, chopped

3 garlic cloves, chopped

1 cup shredded green cabbage

1 Yukon gold potato, peeled and chopped into bite-size pieces

4 cups Homemade Vegetable Stock (see the "**Basics**" section) or water

1 bay leaf

2 zucchini, chopped into bite-size pieces

2 large tomatoes, chopped

½ pound string beans, chopped into bite-size pieces

DIRECTIONS

1. Heat 1 tablespoon of the olive oil in a large stockpot over medium heat.
2. Add the onion, carrots, and celery and stir. Sauté for 3 to 5 minutes or until tender.
3. Add the parsley and garlic and cook for 1 minute longer.
4. Stir in the cabbage and potatoes. Pour in the stock or water, add the bay leaf, increase the heat to high, and bring to a boil.
5. Add the zucchini, tomatoes, string beans, and cannellini beans. Simmer, covered, for 30 minutes, or until the vegetables are tender.
6. While the soup is cooking, make the salad dressing by combining ¼ cup of the olive oil with the balsamic vinegar. Add the sea salt and black pepper. Whisk until smooth and creamy and set aside.
7. When the soup is finished cooking, taste, and adjust the seasoning, if necessary.
8. Serve the soup hot, topped with Parmesan cheese. To serve the salad, toss the greens with the vinaigrette.

1 cup cooked cannellini beans or chickpeas

2 tablespoons Amy Riolo Selections or other good-quality white balsamic vinegar

½ teaspoon sea salt

¼ tsp freshly ground black pepper

½ cup freshly grated Parmesan cheese

4 cups mixed greens

PER SERVING: *Calories 877 (From Fat 409); Fat 45g (Saturated 10g); Cholesterol 22mg; Sodium 1029mg; Carbohydrate 96g (Dietary Fiber 24g); Protein 31g.*

TIP: Save this recipe for when you have a little bit of time to spend in the kitchen. This soup will stay fresh in an airtight container in the refrigerator for up to 5 days or the freezer for a few months.

NOTE: *Minestra* is the Italian word for a chunky soup containing many vegetables, grains, and legumes. The suffix *-one* as in *minestrone,* means that the soup has a lot of ingredients. Use what you have on hand in your pantry and refrigerator to come up with your own versions. As long as you have vegetables, beans, and stock, you can make a *minestra* anytime.

VARY IT! Switch up the vegetables according to what's in season and add a handful of small pasta, grains, or rice and different types of beans. You can also make a creamier minestrone by pureeing half of it in a blender and then stirring it back into the pot with the rest of the soup.

Arugula, Quinoa, and Carrot Medley with Raspberries and Pine Nuts

PREP TIME: 10 MIN	COOK TIME: 15 MIN	YIELD: 2 SERVINGS

INGREDIENTS

½ cup dry quinoa, rinsed

½ cup Amy Riolo Selections or other good-quality extra-virgin olive oil

2 tablespoons Amy Riolo Selections or other good-quality white balsamic vinegar

¼ teaspoon sea salt

Freshly ground black pepper

½ cup shredded carrots

11 ounces baby arugula, broccoli, or broccoli rabe

1 cup raspberries or blueberries

2 tablespoons pine nuts

DIRECTIONS

1. Bring 1 cup of water to a boil in a medium saucepan over high heat.
2. Add the quinoa, stir, reduce the heat to low, and cover. Simmer until all the liquid is absorbed, about 10 to 15 minutes. Remove from the stove and let cool completely.
3. In a small bowl, whisk the olive oil, balsamic vinegar, salt, and black pepper together to form a vinaigrette.
4. Place the quinoa in a large bowl and lightly fluff with a fork. Add the carrots, pour the vinaigrette over the top, and toss gently until the quinoa and carrots are well coated.
5. Divide the arugula onto 2 plates. Pour the quinoa mixture over the arugula.
6. Top with the raspberries and pine nuts and serve.

PER SERVING: *Calories 787 (From Fat 574); Fat 64g (Saturated 8g); Cholesterol 0mg; Sodium 303mg; Carbohydrate 47g (Dietary Fiber 11g); Protein 12g.*

TIP: Quinoa is considered a complete protein, so it's a great alternative to meat, fish, and dairy for lunch. Prepare it in advance to toss into salads like this one or eat it with a few berries, nuts, and a drizzle of cinnamon and honey with almond milk for breakfast.

NOTE: Using broccoli instead of the carrots and blueberries instead of the raspberries is a great combination as well.

VARY IT! Arugula is a very nutritious green with a slightly bitter flavor. In the plant world, bitterness is often a sign of high amounts of antioxidants, vitamins, minerals, and fiber. If you're still not a fan, swap out your favorite lettuce green and try incorporating a little bit of arugula, broccoli, or broccoli rabe at a time. If you have fresh herbs like parsley, basil, dill, or cilantro, toss handfuls of them in for extra flavor and nutrients as well.

Vegan Summer Rolls with Peanut Sauce

PREP TIME: 20 MIN	COOK TIME: NONE	YIELD: 2 SERVINGS

INGREDIENTS

4 rice paper wrappers (or large green lettuce leaves)

1 ripe avocado, pitted and sliced

1 red pepper, seeded and thinly sliced

½ cup shredded carrots

½ cup tofu (soft or medium), drained, and thinly sliced

½ cup shredded purple cabbage

8 green lettuce leaves

¼ cup finely chopped mint

Peanut Sauce

¼ cup natural peanut butter

2 tablespoons tamari

2 tablespoons rice vinegar

1 teaspoon raw honey

2 tablespoons water

1 tablespoon grated fresh ginger, or ½ teaspoon ground ginger

1 clove garlic, minced

DIRECTIONS

1. Soak the rice wrappers in cool water for 5 minutes, drain, and lay on a flat surface.
2. Top each rice wrapper with equal parts of all the remaining ingredients and roll up jelly roll fashion (see Figure A-3).
3. Slice each wrap in half on the diagonal and place in a shallow dish.
4. Place all the sauce ingredients in a blender and emulsify or place in a medium bowl and whisk until smooth.
5. Pour the peanut sauce into separate containers for serving and serve immediately or refrigerate until needed.

PER SERVING: *Calories 520 (From Fat 302); Fat 34g (Saturated 5g); Cholesterol 0mg; Sodium 1153mg; Carbohydrate 41g (Dietary Fiber 12g); Protein 18g.*

TIP: Save time by prepping both the vegetables and the peanut sauce in advance. Then you can just assemble the wraps at the last minute.

NOTE: Keep this sauce on hand for grilled chicken or Asian-style rice noodles with green beans and cucumbers.

VARY IT! You can use whatever kind of vegetables you prefer in these colorful wraps; just be sure to include as many shades of the rainbow as possible. The diversity of tastes and textures is what makes this recipe appealing. If you can't find rice wrappers, use lettuce leaves or seaweed paper for even more nutrition.

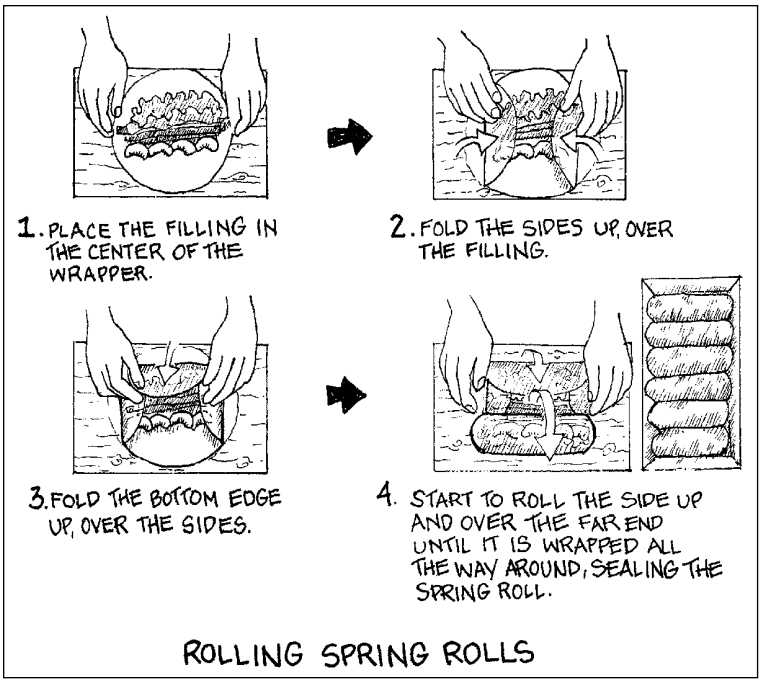
1. PLACE THE FILLING IN THE CENTER OF THE WRAPPER.
2. FOLD THE SIDES UP, OVER THE FILLING.
3. FOLD THE BOTTOM EDGE UP, OVER THE SIDES.
4. START TO ROLL THE SIDE UP AND OVER THE FAR END UNTIL IT IS WRAPPED ALL THE WAY AROUND, SEALING THE SPRING ROLL.
ROLLING SPRING ROLLS

FIGURE A-3: Technique to roll spring or summer rolls.

Chicken and Lettuce Wraps

PREP TIME: 20 MIN	COOK TIME: 20 MIN	YIELD: 2 SERVINGS

INGREDIENTS

2 tablespoons Amy Riolo Selections or other good-quality extra-virgin olive oil

½ pound ground chicken or leftover shredded chicken

1 teaspoon minced garlic

1 tablespoon tamari

1 tablespoon rice vinegar

½ teaspoon Sriracha sauce or your favorite chili paste (optional)

4 ounces portabella mushrooms or other mushrooms, cleaned, trimmed, and chopped

¼ cup shredded carrots

¼ cup finely chopped scallions

1 tablespoon freshly grated ginger, or ½ teaspoon ground ginger

¼ cup chopped fresh cilantro or flat-leaf parsley

1 head bib or romaine lettuce

DIRECTIONS

1. Heat the olive oil in a large skillet over medium-high heat. Add the chicken and brown, stirring it with a wooden spoon and breaking it apart as it cooks.
2. Add the garlic and cook for another minute. Stir in the tamari, vinegar, and Sriracha (if desired) and cook for another minute.
3. Add the mushrooms, carrots, scallions, and ginger and cook for 5 more minutes, stirring occasionally.
4. Remove from the heat and let cool slightly. Stir in the cilantro.
5. Place the lettuce leaves individually on a work surface. Top with even amounts of the chicken mixture and roll up. Use a toothpick or skewer to keep the rolls sealed. Serve warm.

PER SERVING: *Calories 365 (From Fat 215); Fat 24g (Saturated 5g); Cholesterol 98mg; Sodium 635mg; Carbohydrate 15g (Dietary Fiber 8g); Protein 26g.*

NOTE: You can also prepare salads instead of wraps. Just chop the lettuce and put it in bowls with the chicken and vegetable mixture on top.

VARY IT! Use ground turkey, fresh tuna, or firm tofu instead of the ground chicken in this recipe.

ABC Salad with Citrus-Marinated Salmon and Brussels Sprouts

PREP TIME: 15 MIN	COOK TIME: 25 MIN	YIELD: 2 SERVINGS

INGREDIENTS

4 tablespoons Amy Riolo Selections or other good-quality extra-virgin olive oil, divided

¼ cup orange juice

½ teaspoon sea salt, divided

Freshly ground black pepper

Two 4-ounce salmon fillets, skin on

2 cups Brussels sprouts, trimmed and halved

½ sweet onion, thinly sliced

1 large red beet, peeled and quartered

2 carrots, peeled and quartered

1 apple, peeled, cored, and quartered

Juice of 1 lemon

DIRECTIONS

1. In a small bowl, whisk 2 tablespoons of the olive oil, orange juice, ¼ teaspoon of the salt, and pepper together until emulsified.
2. Place the salmon fillets in a glass 10-inch round or 9-x-13-inch baking dish and pour the dressing over the top.
3. Preheat the oven to 400 degrees.
4. Place the Brussels sprouts and onion around the sides of the salmon, and cover with aluminum foil.
5. Bake until the fish flakes easily with a fork and is opaque in color and the Brussels sprouts are tender, about 20 to 25 minutes.
6. While the salmon is roasting, place the beet, carrots, and apple in a food processor and pulse until shredded.
7. Toss with the remaining 2 tablespoons of olive oil, lemon juice, remaining ¼ teaspoon of salt, and freshly ground pepper to taste.
8. To serve, place the salmon and Brussels sprouts in the center of two plates. Top with the salad and serve immediately.

PER SERVING: *Calories 578 (From Fat 315); Fat 35g (Saturated 5g); Cholesterol 62mg; Sodium 630mg; Carbohydrate 43g (Dietary Fiber 10g); Protein 28 g.*

TIP: If not serving immediately, store the salmon and salad separately in the refrigerator.

NOTE: This ABC Salad takes its name from Apples, Beets, and Carrots. I learned it from a class of elementary school children who loved the recipe so much that they asked me to make it for them. A few simple, nutrient-dense ingredients can add a lot of flavor, freshness, and color to any protein. I usually make large batches of the salad and the salmon to serve later. This dish also makes a great dinner.

VARY IT! Any kind of firm-fleshed fish or lean poultry would work well in this recipe. Don't have time to make the ABC Salad? Swap out your favorite greens instead.

Dinner

In many Western countries, dinner is the largest meal of the day. For reasons we mention earlier in this appendix, it's in your best interest to eat a bit more lightly at dinnertime, and to enjoy a walk afterward, if possible. The recipes in this section include lean, quality protein; good sources of fat; and the best types of carbohydrates to keep your body fueled through the evening. Best of all, they include some "fan favorites" from Amy's recipe collection with lots of varieties of flavors and styles of cooking. Try to cook double quantities, when possible, so that you can enjoy the meal for lunch the next day as well.

Korma-Style Chicken Curry with Broccoli

PREP TIME: 10 MIN	COOK TIME: 30 MIN PLUS 3 HOURS OR OVERNIGHT TO MARINATE	YIELD: 4 SERVINGS

INGREDIENTS

- 2 teaspoons minced fresh ginger
- 2 teaspoons minced garlic
- 2 teaspoons garam masala
- 1 teaspoon black cumin seeds
- 1 teaspoon ground coriander
- 1 teaspoon ground almonds (almond meal)
- ¼ teaspoon sea salt
- ¼ teaspoon ground cardamom
- ½ cup plain, Greek yogurt
- Four 4-ounce chicken breasts
- ¼ cup Amy Riolo Selections or other good-quality extra-virgin olive oil, divided
- 2 yellow onions, sliced
- 1 head broccoli florets
- 1 cup water
- ½ cup finely chopped fresh cilantro (optional)
- 1 head lettuce, trimmed and shredded (optional)

DIRECTIONS

1. In a medium bowl, mix the ginger, garlic, garam masala, cumin seeds, coriander, ground almonds, salt, cardamom, and yogurt until well combined.
2. Place the chicken in a large shallow baking dish and spoon the yogurt mixture over the top. Turn to coat, cover with plastic wrap, and refrigerate for 3 hours or overnight.
3. Heat a very large, wide skillet with a lid to medium-high heat and add 3 tablespoons of the olive oil.
4. Add the onions and cook, stirring occasionally, until soft and golden, approximately 7 to 8 minutes.
5. Add the chicken and brown on each side, approximately 3 to 4 minutes per side.
6. Add the broccoli, and turn to coat. Add the water and stir.
7. Cover and cook for 10 to 14 minutes, or until the broccoli is tender and the chicken is cooked through and registers 165 degrees on a meat thermometer.
8. Garnish with the remaining tablespoon of olive oil and cilantro (if desired), and serve warm over shredded lettuce (if desired).

PER SERVING: *Calories 285 (From Fat 142); Fat 16g (Saturated 3g); Cholesterol 15mg; Sodium 231mg; Carbohydrate 26g (Dietary Fiber 6g); Protein 14g.*

TIP: Be sure to allow enough time for the chicken to marinate.

NOTE: This dish is inspired by the famous chicken korma, but by using extra-virgin olive oil (instead of vegetable oil) and increasing greens such as cilantro and broccoli, it's additionally beneficial to those with diabetes. The spices in the dish, such as black cumin, ginger, and garlic, have wonderful anti-inflammatory and antioxidant properties.

VARY IT! Firm-flesh fish and lamb also tastes great this way. This dish is normally served with rice. If you want to serve it with a more complex carbohydrate, use ½ cup of cooked millet or brown basmati rice per serving.

Roasted Turkey Breast with Pomegranate, Red Pepper, and Walnut Sauce

PREP TIME: 15 MIN	COOK TIME: 2 HR	YIELD: 4 SERVINGS

INGREDIENTS

2 tablespoons Amy Riolo Selections or other good-quality extra-virgin olive oil, divided

One 4- to 5-pound turkey breast

1 teaspoon sea salt

Freshly ground black pepper

1 teaspoon poultry seasoning

2 lemons, 1 halved and 1 whole

1 sprig fresh rosemary

1 sprig fresh thyme

1 sprig fresh sage

2–3 cups water

DIRECTIONS

1. Preheat the oven to 425 degrees. Use 1 tablespoon of the olive oil to grease the bottom of a large roasting pan.
2. Wash and dry the turkey thoroughly. Season both sides with salt and pepper.
3. Place the turkey breast in the pan. Brush the turkey with another tablespoon of the olive oil.
4. Sprinkle the poultry seasoning on the turkey and rub it into the skin with your hands.
5. Place 1 lemon half, the rosemary, thyme, and sage in the pan.
6. Add 2 cups of water to the bottom of the pan, and roast, uncovered, for 1 hour.
7. Drizzle the turkey with juice from the other half of the cut lemon after the first hour of cooking. If there's no liquid left in the bottom of the pan, add another cup of water. If the turkey looks very brown, cover it with aluminum foil. Continue to bake for another 20 to 30 minutes or until the internal temperature of the thickest part of the breast reads 170 degrees on a meat thermometer.

Walnut Sauce

⅓ cup Amy Riolo Selections or other good-quality extra-virgin olive oil

3 ounces roasted red peppers, drained and rinsed

2 tablespoons Homemade Bread Crumbs (see the "**Basics**" section), or almond flour

¼ cup raw walnuts

2 cloves garlic, minced

2 tablespoons pomegranate molasses (available in Middle Eastern markets), or pomegranate juice

Handful of fresh flat-leaf parsley, for garnish

8 Remove the pan from the oven and place it on a carving board. Let rest for 10 minutes before carving.

9 While the turkey is resting, make the walnut sauce. Combine the olive oil, juice from the remaining whole lemon, red peppers, bread crumbs, walnuts, garlic, and pomegranate molasses in a food processor or high-speed mixer and blend on high to form a paste. If the paste is too thick to spread, add water, a tablespoon at a time, until you have the consistency of a spreadable sauce.

10 Place the turkey breast on a cutting board and slice thinly. Then place on a platter. Spoon the sauce over the top, slather it around the turkey with a knife, garnish with parsley, and serve.

PER SERVING: *Calories 357 (From Fat 205); Fat 23g (Saturated 3g); Cholesterol 69mg; Sodium 612mg; Carbohydrate 9g (Dietary Fiber 1g); Protein 28g.*

TIP: Make the sauce in advance to save time, if desired, or roast the turkey a day ahead and reheat it before serving.

NOTE: This dish is a riff on a classic Persian dish of duck simmered in spices and pomegranate molasses. Amy's version includes classic roasted meat dressed with m'hammara, a Middle Eastern pomegranate dip on top. The dip, or sauce, as it becomes when water is added to it, tastes great with crudités or whole wheat pita chips as an appetizer or dip along with hummus. This diabetes-friendly recipe maintains the flavor while amping up the nutrient content. This recipe is easy enough to cook anytime but delicious enough to eat on a special occasion.

VARY IT! Use a chicken breast or a whole chicken in place of the turkey.

Spinach, Strawberry, and Avocado Salad with Lentil and Goat Cheese Bruschetta

PREP TIME: 15 MIN	COOK TIME: 5 MIN	YIELD: 4 SERVINGS

INGREDIENTS

¾ cup brown lentils, cooked (see the "**Basics**" section)

¼ cup goat cheese

4 slices whole grain or gluten-free bread

1 garlic clove, peeled

⅓ cup Amy Riolo Selections or other good-quality extra-virgin olive oil, divided

¼ cup freshly chopped cilantro or flat-leaf parsley

1 pound baby spinach, washed and dried

1 cup strawberries, sliced

2 avocados, peeled, pitted, and sliced

¼ cup sliced almonds

¼ cup Amy Riolo Selections or other good-quality white balsamic vinegar

¼ teaspoon sea salt

⅛ teaspoon freshly ground black pepper

DIRECTIONS

1. Place the lentils and goat cheese in a blender or mixer. Pulse until creamy.
2. Place the bread on a baking sheet under the broiler and toast on each side until golden.
3. Remove the bread from the oven, and when it's cool enough to touch, rub the garlic over both sides of the slices.
4. Divide the lentil mixture among the bread slices and drizzle 1 tablespoon of the olive oil over the top (¼ tablespoon over each slice).
5. Top with the cilantro and place on a platter.
6. To make the salad, combine the spinach, strawberries, avocado, and almonds in a bowl.
7. Place the remaining olive oil, vinegar, salt, and pepper in a small bowl and whisk to combine until smooth.
8. Drizzle the dressing over the salad and toss to combine.
9. Divide the salad and bruschetta evenly among 4 plates.

PER SERVING: *Calories 550 (From Fat 357); Fat 40g (Saturated 7g); Cholesterol 7mg; Sodium 387mg; Carbohydrate 39g (Dietary Fiber 16g); Protein 16g.*

TIP: Cook the lentils and prep the vegetables in advance to save time.

NOTE: This dish makes a light, fresh dinner that is perfectly suited to eating outside. Make extra to bring for lunch. You can add leftover protein to the salad for a quick, tasty, and nutritious lunch.

VARY IT! Swap out the goat cheese for feta and the spinach for another green. You can also swap the lentils for another kind of bean, such as chickpeas, fava, or cannellini.

Lemon, Garlic, and Herb Roasted Chicken with Cauliflower, Tomatoes, and Asparagus

PREP TIME: 15 MIN	COOK TIME: 90 MIN	YIELD: 4 SERVINGS

INGREDIENTS

1 whole (3½-pound) chicken, cleaned and rinsed well

¼ cup Amy Riolo Selections or other good-quality extra-virgin olive oil

1 teaspoon sea salt

¼ teaspoon freshly ground pepper

1 head garlic, stem end sliced off, left intact

1 lemon, halved

1 teaspoon finely chopped fresh rosemary

1 teaspoon finely chopped fresh sage or thyme

1 bunch fresh asparagus, cleaned and bottoms trimmed

1 head cauliflower, washed and cut into florets with 1-inch stems

1 pint cherry tomatoes

DIRECTIONS

1. Preheat the oven to 425 degrees.
2. Place the chicken in a roasting pan and drizzle with the olive oil, turning the chicken to make sure that both the pan and chicken are coated.
3. Season with the salt, black pepper, and herbs by rubbing them into the top and sides of the chicken.
4. Place the garlic and 1 lemon half inside the chicken cavity. Squeeze the juice from the other lemon half over the chicken. Make sure the chicken is breast-side up in the pan.
5. Bake, uncovered, for 45 minutes. Carefully remove the pan from the oven (oil tends to splatter), and place the asparagus, cauliflower, and cherry tomatoes around the edges; turn to coat in olive oil.
6. Return the pan to the oven to bake for another 30 to 45 minutes, or until the chicken is done and vegetables are tender. (Chicken is done when clear juices run from the thickest part of the thigh after being pierced with a fork and a thermometer registers 165 degrees at the thickest part.)
7. Cover the chicken with foil and let rest for 10 minutes before carving.
8. Remove the garlic and lemon from the chicken cavity and discard before serving. Place the chicken on a platter with the vegetables and tomatoes in a separate bowl.

PER SERVING: *Calories 428 (From Fat 283); Fat 31g (Saturated 7g); Cholesterol 98mg; Sodium 595mg; Carbohydrate 14g (Dietary Fiber 5g); Protein 24g.*

Whole Wheat Linguine with Fresh Tuna and Fagiolini

PREP TIME: 10 MIN	COOK TIME: 20 MIN	YIELD: 4 SERVINGS

INGREDIENTS

2 tablespoons Amy Riolo Selections or other good-quality extra-virgin olive oil

Three 5-ounce tuna steaks

1 medium yellow onion, thinly sliced

½ cup freshly squeezed lemon juice (about 1 or 2 lemons)

½ pound green beans, trimmed and cut in half on the diagonal

1 cup cherry or grape tomatoes

¼ cup pine nuts

¼ teaspoon sea salt

Freshly ground black pepper

½ cup water

1 pound whole wheat linguine, or gluten-free pasta

¼ cup freshly chopped mint, for garnish

½ cup finely chopped fresh parsley, for garnish

DIRECTIONS

1. Heat the olive oil in a very large skillet over medium-high heat. Add the tuna steaks and cook 2 to 3 minutes per side until golden. Remove the tuna from the pan and place on a platter. Set aside.

2. Add the onions to the pan. Stir, turn down the heat to medium, and sauté, uncovered, until onions are translucent, about 5 to 7 minutes.

3. Add the lemon juice, stir well to combine, and cook, uncovered, for 2 to 3 minutes.

4. Return the tuna steaks to the skillet, cover, and cook for 3 to 5 minutes per side until the tuna is cooked to your preferred doneness. Transfer the tuna from the pan to a cutting board.

5. Bring a large pot of water to a boil over high heat.

6. Add the green beans, cherry tomatoes, and pine nuts to the pan. Add the salt, pepper, and water. Stir well, cover, and cook on low.

7. Season the boiling water with salt and add the linguine. Reduce the heat to medium and cook, stirring often, 7 to 8 minutes, or until the pasta is firm to the bite (this is usually 1 minute less than the timing on the package directions).

8. Remove the linguine from the water with tongs and add to the skillet with the cooked vegetables.

9 Slice the tuna into large pieces and toss with the pasta and vegetables.

10 Sprinkle the mint and parsley over the top of the dish. Serve warm.

PER SERVING: *Calories 687 (From Fat 139); Fat 15g (Saturated 2g); Cholesterol 48mg; Sodium 184mg; Carbohydrate 101g (Dietary Fiber 4g); Protein 45g.*

TIP: You can also use grilled fish in this recipe.

NOTE: Italians don't typically serve seafood pasta with cheese, hence the parsley for garnish. This recipe is full of protein, quality carbs, and antioxidants. The green beans have a diuretic effect, and the parsley is a powerful detoxifier.

VARY IT! The tuna steaks in this recipe could be left whole and served with the green beans (fagiolini) and tomato–pine nut mixture alone, without the linguine. Whole wheat couscous would be another great option.

Sizzling Shrimp and Fresh Vegetable Fajitas

PREP TIME: 15 MIN	COOK TIME: 15 MIN	YIELD: 4 SERVINGS

INGREDIENTS

2 tablespoons Amy Riolo Selections or other good-quality extra-virgin olive oil

1 large yellow onion, sliced

2 garlic cloves, minced

1 green bell pepper, seeded and sliced

1 red bell pepper, seeded and sliced

2 portabella mushrooms, cleaned and sliced

¼ teaspoon sea salt

⅛ teaspoon freshly ground black pepper

½ teaspoon chili powder

½ teaspoon paprika

½ teaspoon ground cumin

1 pound shrimp, peeled and deveined

2 limes, 1 halved, 1 quartered

Handful of fresh cilantro leaves

4 whole wheat tortillas or 8 large lettuce leaves

DIRECTIONS

1. Heat the oil in a large, wide skillet over medium heat.
2. Add the onions and cook 5 to 7 minutes, until light golden.
3. Add the garlic, stir, and cook another minute.
4. Add the peppers, mushrooms, salt, pepper, chili powder, paprika, and cumin and stir well to combine.
5. Turn the heat to medium-high and cook until the vegetables are slightly soft. (See the Note.)
6. Add the shrimp, stir, and cook 1 to 2 minutes per side until opaque and cooked through.
7. Squeeze the lime juice from the 2 lime halves over the top.
8. Taste, adjust the seasoning, if necessary, and serve with tortillas or lettuce leaves to wrap the vegetables and shrimp in and lime quarters on the side.

PER SERVING: *Calories 323 (From Fat 86); Fat 10g (Saturated 1g); Cholesterol 172mg; Sodium 468mg; Carbohydrate 32g (Dietary Fiber 5g); Protein 28 g.*

TIP: Purchase shrimp with shells on so that you can use them to make stock at a later date. See the stock recipe in the "Basics" section earlier in this chapter.

NOTE: If the vegetables take too long to cook, try adding ½ cup water, stirring, and increasing the heat to high until they're tender.

VARY IT! You can use chicken breast cubes or skirt steak in place of the shrimp.

Beef, Broccoli, and Sweet Pepper Stir-Fry with Brown Rice

PREP TIME: 15 MIN	COOK TIME: 30 MIN	YIELD: 4 SERVINGS

INGREDIENTS

1 cup brown rice or millet

2 tablespoons Amy Riolo Selections or other good-quality extra-virgin olive oil

1 yellow onion, sliced

1 pound flank steak or sandwich steak, cut into bite-size strips

1 pound broccoli, cut into florets

1 green bell pepper, seeded and cut into chunks

2 red bell peppers, seeded and cut into chunks

2 carrots, peeled and sliced into rounds

1 teaspoon fresh ginger, grated

3 garlic cloves, grated

1 cup hot water

6 tablespoons low-sodium tamari

¼ teaspoon freshly ground black pepper

1 tablespoon raw honey

1½ tablespoons cornstarch

DIRECTIONS

1. In a saucepan with a well-fitting lid, prepare the brown rice or millet according to the package directions.
2. In a large wide skillet or wok over medium-high heat, add the olive oil and onion slices. Cook, stirring often, until translucent, approximately 5 minutes.
3. Add the beef to the skillet and cook until browned on all sides.
4. Add the broccoli, peppers, and carrots, and mix well. Cook, uncovered, for a few minutes.
5. In a medium bowl, whisk together all the remaining ingredients to make a sauce.
6. Pour the sauce over the beef and vegetables and stir well to coat.
7. Cover, reduce the heat to medium-low, and simmer for 10 minutes, or until the vegetables are tender.
8. When the rice or millet is cooked, spoon into serving bowls and top with equal portions of the beef stir-fry.

PER SERVING: *Calories 542 (From Fat 144); Fat 16g (Saturated 4g); Cholesterol 48mg; Sodium 1187mg; Carbohydrate 64g (Dietary Fiber 8g); Protein 36g.*

TIP: The cuts of meat labeled "sandwich meat" work the best for this recipe.

VARY IT! Use chicken instead of beef and swap the vegetables for green beans, cauliflower, and zucchini.

Snacks

To prevent blood sugar fluctuations, it's a good idea for those with diabetes to eat something every 4 to 5 hours. Breakfast at 8 a.m., lunch at 1 p.m., and dinner at 6 p.m., for example, is a great model in terms of spacing out meals. If you go more than this amount of time between meals, or need additional fuel to get your through, snacks can be a great option. Be sure to consume a small serving of your favorite option that includes a healthful fat, good-quality carbohydrates, and protein for best results. Here are some ideas:

- 10 almonds with a small apple or other piece of fruit
- ½ cup Greek yogurt with a bit of extra-virgin olive oil or raw honey and pure cinnamon on top
- 1 cup of fresh berries with 1 tablespoon of flax seeds
- ⅓ cup of homemade hummus drizzled with extra-virgin olive oil and raw broccoli, celery, and carrot sticks
- A small portion of one of the breakfast foods in this appendix

REMEMBER

Depending on your blood sugar readings, a snack like this prior to sleeping could be a good way to keep your levels balanced through the night. Be sure to discuss this option with your doctor or dietician.

Classic Hummus with Broccoli and Cauliflower Crudités

PREP TIME: 10 MIN	COOK TIME: NONE	YIELD: 4 SERVINGS

INGREDIENTS

1 cup cooked or no-salt-added canned chickpeas, drained and rinsed if using canned beans

1 garlic clove, minced

⅓ cup tahini (sesame puree)

3 tablespoons Amy Riolo Selections or other good-quality extra-virgin olive oil, divided

½ teaspoon salt

2 ice cubes

Dash of paprika, for garnish

2 cups broccoli florets, for serving

2 cups cauliflower florets, for serving

DIRECTIONS

1. Peel the chickpeas by holding each one in between your fingers and pressing down to push the chickpea out of its white skin (see Tip). Place them in a food processor, reserving a few for garnish.
2. Add the garlic, tahini, 2 tablespoons of the olive oil, and salt to the food processor. Puree until smooth.
3. Add the ice cubes and continue to puree.
4. If the hummus isn't creamy enough, add water, a tablespoon at a time, to get an extra creamy consistency. (You should need less than ¼ cup in total.)
5. Scrape down the sides of the food processor and puree for 1 to 2 additional minutes. Taste and adjust seasonings if necessary.
6. Spoon the hummus onto a small round dish. Using the back of a spoon, make dents in the top and fill the dents with the remaining tablespoon of olive oil.
7. Sprinkle with the paprika and arrange the remaining chickpeas on the top. Serve with the broccoli and cauliflower.

(continued)

PER SERVING: *Calories 303 (From Fat 195); Fat 22g (Saturated 3g); Cholesterol 0mg; Sodium 385mg; Carbohydrate 22g (Dietary Fiber 8g); Protein 9g.*

TIP: Middle Eastern cooks peel chickpeas before making Hummus bil tahina (the original name of the dish) for a smoother consistency. I peel chickpeas when I am prepping base ingredients and store them in the refrigerator until needed so that I don't have to do it at the last minute. I usually do this task while I'm talking on the phone or watching a movie. Of course, this step could be omitted if necessary. If not serving immediately, store the hummus in a container with a lid in the refrigerator for up to 5 days.

NOTE: In the Eastern Mediterranean countries, hummus can be served with slices of meat or chicken on top. If you have leftover meat, this is a great way to make a full meal out of it.

VARY IT! You can make a delicious, nutritious, and creamy puree out of all kinds of beans and lentils. Just don't call it hummus! The word *hummus* means *chickpea* in Arabic.

Date, Sesame, and Almond Balls

PREP TIME: 10 MIN	COOK TIME: NONE	YIELD: 12 SERVINGS

INGREDIENTS

1 pound soft dates, pitted

2 tablespoons Amy Riolo Selections or other good-quality extra-virgin olive oil

¼ cup water

½ pound blanched almonds

1 teaspoon vanilla extract

1 teaspoon ground cardamom

½ teaspoon ground cinnamon

1 cup sesame seeds, toasted

DIRECTIONS

1. Place the dates, olive oil, water, almonds, vanilla, cardamom, and cinnamon in a food processor.
2. Pulse to form a smooth paste. Shape the dough into date-size balls.
3. Spread the sesame seeds on a baking sheet.
4. Roll the date balls in the sesame seeds to coat. Arrange on a serving platter.

PER SERVING: *Calories 306 (From Fat 160); Fat 18g (Saturated 2g); Cholesterol 0mg; Sodium 6mg; Carbohydrate 36g (Dietary Fiber 7g); Protein 7g.*

TIP: Keep these on hand for a quick snack in between meals or as a post-workout treat.

NOTE: Kids love shaping these sweet treats, and they're a good source of nutrients for them.

VARY IT! Even a few dates and a handful of raw almonds make a great snack on the go.

Tzatziki (Greek Cucumber and Yogurt Sauce)

PREP TIME: 10 MIN	COOK TIME: NONE	YIELD: 4 SERVINGS

INGREDIENTS

3 cups plain, low-fat Greek yogurt, preferably made from sheep and goat milk, if possible

2 organic English cucumbers, peeled and shredded

¼ teaspoon sea salt

¼ cup fresh dill or mint, chopped, plus 1 sprig fresh for garnish

1 garlic clove, minced

1 small yellow onion, grated and drained

2 tablespoons Amy Riolo Selections or other good-quality extra-virgin olive oil, for garnish

Pita, for serving

Crudités, for serving

DIRECTIONS

1. Place the yogurt in a large bowl. Add the shredded cucumbers to the bowl.
2. Stir in the salt, dill, garlic, and onion.
3. Transfer to a bowl or serving platter. With the back of a spoon, make indentations in the top and drizzle with the olive oil.
4. Garnish with a sprig of mint or dill and serve with pita and crudités.

PER SERVING: *Calories 221 (From Fat 92); Fat 10g (Saturated 3g); Cholesterol 19mg; Sodium 178mg; Carbohydrate 16g (Dietary Fiber 1g); Protein 18g.*

TIP: If you can't find English cucumbers, Persian cucumbers work well in this recipe too. If you have to use conventional American cucumbers, remove the seeds before making this dip.

NOTE: This classic combination is one of the healthiest dishes possible due to the antioxidants, minerals, and vitamins in the cucumbers and the macronutrients and inulin (a compound that helps keep blood sugar balanced) and probiotics in the yogurt, and the anti-inflammatory aspects of the garlic, onion, and extra-virgin olive oil. This is a mouthwatering and nutritious recipe. Use this as a dip or a sauce for grilled chicken and meat. In the summertime, it makes a cool and creamy breakfast.

VARY IT! Place this mixture in the blender and puree until smooth. Refrigerate overnight for a cold soup.

Cannellini Bean and Feta Dip with Pita Chips

PREP TIME: 10 MIN	COOK TIME: NONE	YIELD: 4 SERVINGS

INGREDIENTS

1½ cups cooked cannellini beans (see the "Basics" section)

1 cup feta cheese, cut into small pieces or crumbled

Zest and juice from 1 lemon

¼ cup Amy Riolo Selections or other good-quality extra-virgin olive oil

¼ cup fresh mint, plus extra for garnish

¼ cup fresh oregano leaves, plus more for garnish

⅛ teaspoon sea salt

⅛ teaspoon freshly ground black pepper

2 pieces whole wheat pita, cut into pieces and toasted under the broiler until golden

DIRECTIONS

1. Combine the cannellini beans, feta, lemon zest and juice, olive oil, mint, and oregano in a food processor.
2. Pulse to puree until smooth.
3. Taste and season with salt and pepper. Serve with pita chips.

PER SERVING: *Calories 349 (From Fat 199); Fat 22g (Saturated 8g); Cholesterol 33mg; Sodium 649mg; Carbohydrate 27g (Dietary Fiber 5g); Protein 13g.*

TIP: This dip also tastes great tossed into hot pasta as a sauce.

NOTE: If you like hummus, you'll appreciate the fresh and healthful flavors in this dip.

VARY IT! You can use cooked fava beans instead of the cannellini beans.

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About the Authors

Dr. Simon Poole, MBBS, DRCOG, FBMA, MIANE, is a primary care physician in Cambridge, England, with a particular interest in lifestyle medicine and nutrition as well as the management of long-term medical conditions. He has taught and undertaken research with Cambridge University and is a founding member of the British and European Associations of Lifestyle Medicine. Simon is a council member of The US True Health Initiative and an International Senior Collaborator with the Global Centre for Nutrition and Health in Cambridge; and he was awarded Fellowship of the British Medical Association for services to the profession in 2018, which included longstanding membership of Council of the Royal College of General Practitioners and Public Health Medicine Committee. Simon is a recognized international authority and speaker on lifestyle medicine, chairing the Food Values Conference series at the Pontifical Academy of Science of The Vatican, and the author of the award-winning book *The Olive Oil Diet* (2016, Hachette) and *The Real Mediterranean Diet* (2021, Cambridge Academic).

Amy Riolo is a best-selling author and an award-winning chef, television host, and Mediterranean Diet ambassador. The author of 11 books (*Diabetes For Dummies* is number 13), Amy has been named The Ambassador of Italian Cuisine in the US by The Italian International Agency for Foreign Press, Ambassador of the Italian Mediterranean Diet 2022–2024 by the International Academy of the Italian Mediterranean Diet in her ancestral homeland of Calabria, Italy, and Ambassador of Mediterranean Cuisine in the World by the Rome-based media agency We The Italians. Amy is the brand ambassador for the Maryland University of Integrative Health and the Pizza University and Culinary Arts Center in Maryland as well as Ristorante d'Amore in Capri, Italy. In 2019, she launched her own private label collection of premium Italian imported culinary ingredients called Amy Riolo Selections, which includes extra-virgin olive oil, balsamic vinegar, and pesto sauce from award-winning artisan companies.

Dedication

From Simon: I dedicate my contributions to this book to my wife, Roslyn, for her love, patience, and encouragement.

From Amy: I dedicate my contributions to this book to my parents, Faith and Rick Riolo, for their love and support.

Authors' Acknowledgments

The authors would like to thank Dr. Alan L. Rubin for his comprehensive original editions of this book. At Wiley, we would like to thank Tracy Boggier for being so enthusiastic, efficient, and great to work with. We truly appreciate the expert and efficient editorial support and guidance of Charlotte Kughen, and thank Kristie Pyles for all of her support as well.

From Simon: I shall always be indebted to my late parents, Trevor and Audrey Poole, and my sister, Penny, for the support I received in my ambition to study medicine and become a doctor. I was privileged to have some extraordinary and inspiring teachers during my early education in Aberystwyth as well as my medical tuition in London. During my years as a practicing physician in Cambridge, my patients have been my greatest teachers, and it has been an extraordinary privilege to support families and individuals during challenging journeys through illness or in moments of celebration of healing or new birth. As my interest in preventative medicine increased, patients whose lives were transformed by advice were an inspiration to research, to write, and to share stories to help others understand the benefits of a more integrated approach to health.

I am grateful for the wise guidance of Judy Ridgway, coauthor of my first book, and to Andrew Young from Cambridge Academic.

It is impossible to mention all those individuals and organizations that have has so generously supported me in my advocacy of lifestyle medicine but special thanks are due to my exceptional medical partners at my practice in Cambridge and so many people at the British Medical Association, the Global Centre for Nutrition and Health, and the Department of Food and Nutrition at the University of Parma.

I am especially appreciative of Joe Profaci, who invited me to speak at the Harvard Club in New York on the Mediterranean diet and diabetes. That's where I first met Amy, who introduced me to the Wiley team and who had the vision to create a book that not only supports understanding of a medical condition but brings all her positive and holistic energy to creating the opportunity for people to live their best and most fulfilled life.

From Amy: My earliest memories of cooking were with my mother, Faith Riolo, who taught me that food was not just something we eat to nourish ourselves but an edible gift that could be given to express love. When she was later diagnosed with diabetes, it was my love for her and my desire to create delicious and nutritious meals for my parents that eventually led me to write books on the topic. I owe much of my professional culinary success to my father, Rick Riolo, for always believing in my talent and supporting my career goals. To my beloved little

brother, Jeremy, you are my why, and I am grateful to be able to pass our family's knowledge down to you.

My nonna, Angela Magnone Foti, taught me to cook and bake, as well as valuable lessons that served me outside of the kitchen. My Yia Yia, Mary Michos Riolo, shared her beloved Greek traditions with me as well. I would probably never have published a cookbook if it weren't for my mentor, Sheilah Kaufman, who patiently taught me much more than I ever planned on learning. I am proud to pass her knowledge on to others. Without the assistance and guidance of my late friend, spirit sister, and healer Kathleen Ammalee Rogers, I would never have been able to realize my professional writing goals. I am very thankful to Chef Luigi Diotaiuti for always believing in me and for encouraging me to foster my dreams and goals. Your support means the world to me, and I'm blessed to have you in my life.

There are dozens of people whom I am proud to call friends and colleagues that I interact with daily and whom each indirectly enable me to achieve my goals. I am grateful to each of you. And finally, I would like to thank my coauthor, Dr. Simon Poole, for his tremendous knowledge and commitment to the cause of promoting health and happiness, for always inspiring me, and for valuing my voice. It is a pleasure and an honor to collaborate with you.

Publisher's Acknowledgments

Acquisitions Editor: Tracy Boggier
Project Editor: Charlotte Kughen
Copy Editor: Jennette ElNaggar
Technical Editors: Liz Lipski and Rachel Nix
Production Editor: Saikarthick Kumarasamy
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